

VALUE OF WATER

Roundtable Report



Sponsored by:
American Water Works Association Research Foundation

Facilitated by:
National Water Research Institute

September 23-25, 2003

Kellogg West Conference Center
California Polytechnic University,
Pomona, California

Value of Water

NGT ROUNDTABLE REPORT

Sponsored by:
American Water Works Association Research Foundation

Facilitated by:
National Water Research Institute

September 23-25, 2003

Kellogg West Conference Center
California Polytechnic University,
Pomona, California

FOREWORD

If water is so widely recognized as the most essential substance to sustain life, why then is it among the most undervalued resource in the world? In general, people do not comprehend the services that water provides to sustain a nation's economic development and well being of its population. Where would the manufacturing, electronics, or aerospace industries be without water? Water provides psychological services, too. People derive pleasure from recreational activities and find comfort knowing that the water they drink is of the highest quality.

In western societies, water remains a mystery. Why? One reason might be that water utility managers have been so successful in providing high-quality water on demand – 24 hours a day to their customers – that the process of treating and delivering water remains of little or no concern.

The real value of water is not the price or cost associated with its production – the real value of water is related to the services it provides. Water to sustain human life can be assigned a particular value; water used for environmental purposes, such as developing and maintaining wetlands, can be assigned another value. One might speculate that the misuse and abuse of water is the direct result of the perception that it has no value.

The roundtable was based on the Nominal Group Technique (NGT), which was developed by Andre Delbecq, Ph.D., at the University of Santa Clara. Since 1992, NWRI has used the NGT format as a process for identifying, prioritizing, and developing approaches to address critical local, state, and national water issues. The NGT process provides a controlled environment that allows every voice to be heard regardless of perspective. The ability of the roundtable participants to focus on a single question allowed for the maximum use of time and energy. The participants who attended were invited because of their expertise and credibility in their respective fields.

This report documents the results of the efforts of the 20 roundtable participants who provided their expertise to answer the question: *What critical issues must be overcome if a broader recognition of the value of water is to be integrated into the planning and management of water resources?*

This document comprises two parts. Part 1 (Working Group Reports) presents a more detailed version of the top 10 issues that were prioritized from the 21 consolidated issues generated during the NGT portion of the roundtable. Participants were assigned to one of the 10 working groups and asked to digest and synthesize all of the individual issues consolidated under their particular overarching issue. The PowerPoint slides used by the working group during their presentations can be found in Appendix E.

Part 2 (NGT Roundtable) reports the results of the issue identification and consolidation elements of the roundtable. The participants identified 66 issues that were consolidated into 21 overarching themes. The fact that the participants were able to identify 66 issues demonstrates the significant need to address planning and implementation issues.

The success of any activity is due in great part to the participants and their enthusiasm for engagement in the process. The participants in this workshop are to be commended for their great enthusiasm! Special thanks go to Robert Raucher, Executive Vice President, Stratus Consulting, Inc., and AwwaRF for their support and confidence in the NGT roundtable approach to delivering successful consensus building.

Thanks are also extended to the NWRI team that facilitated the roundtable: Brian Brady, who so masterfully served as the Roundtable Secretary and kept track of the issues to ensure their clarity, and to Tammy Russo, Meeting Coordinator; Patricia Linsky and Gina Melin, Editors; Barbara Close, Graphics Coordinator; Tim Hogan, Graphics Assistant; Linda Harp, Helen Fickensher, and Moya Lyttle, Word Processors; and Teresa Taylor, Photographer.

Ronald B. Linsky
Executive Director
National Water Research Institute

CONTENTS

Foreword		i
Contents		iii
Group Photograph of Participants		v
Part 1: Working Group Reports		1
Priority 1	Develop a Common Parlance (a Clear Set of Terms) That Will Describe the Type of Values That People Derive from Water	3
Priority 2	Estimate the Monetary Worth (Dollar Value) of Water for Various Uses	7
Priority 3	Make All Values Count in Decision Making	13
Priority 4	Triple Bottom Line with a Twist	17
Priority 5	Value the Reliability and Security of Water Supplies	21
Priority 6	Ethics and the Politics of Water: May the “Force” Be with You	25
Priority 7	Cumbersome and Complicated Legal Procedures That Inhibit Local Priorities and Economic Processes	31
Part 2: NGT Roundtable		39
Priority Ranking of Issues by Participants		
Priority 1	Develop a Common Parlance (a Clear Set of Terms) That Describes the Type of Values That People Derive from Water	41
Priority 2	Estimate Worth (Dollar Value) of Water for Various Uses	47
Priority 3	What Values “Count” in Decision Making?	51
Priority 4	Triple Bottom Line with a Twist	55

Priority 5	Valuing the Reliability and Security of Water Supplies	61
Priority 6	Need Open Discussions of Ethical Dilemmas – How Do We Select among Competing Values?	67
Priority 7	Cumbersome Legal and Institutional Processes for Adjudicating “Rights,” Assigning Responsibilities, and Balancing Tradeoffs and Priorities	73
Priority 8	Rate-Setting Strategies Have Distorted the “Value” Signal Being Sent to Customers	81
Priority 9	Lack of Public Awareness That Value Depends on Quantity; More Water Equals Less Per Unit Value	85
Priority 10	Information on Demand Elasticities of Water Use in Municipal Systems Is Incomplete	91
Priority 11	Politics and Human Nature in Water Value Determination	97
Priority 12	Impact of Water Quality on the Value of Water Is Difficult to Assess Due to a Suite of Dynamic Factors	103
Priority 13	Cultural Values Associated with Water Are Difficult to Capture/Quantify and May Not Be Rational	107
Priority 14	Involve the Historically Disenfranchised Communities/Publics into the Water Dialogue	111
Priority 15	Environmental Values and Sustainable Natural Resources Must Be Taken into Account and Quantified to the Extent Possible in Water-Resource Management	113
Priority 16	Mismatch between Concerted Efforts of Advocates and the Dispersed Interests of the Public	115
Priority 17	Water System Efficiency: Consolidation to Achieve Cost Reduction	117
Priority 18	Who Controls the Services? The Public Versus Private Ownership Debate Must Be Considered and Resolved	119
Priority 19	Need for Improved Long-Term Monitoring of the State of Water Resources and Their Uses	121

Priority 20	Insufficient Recognition of the Link between Surface Water and Groundwater	123
Priority 21	Rethink Clean Water Act Beneficial Uses	125
Strength of Feeling Analysis		127
Table 1	Strength of Feeling Analysis	128
Appendices		131
A	Acronyms	133
B	Previous NGT Workshops Conducted by NWRI	135
C	Participants' Biographical Sketches	139
D	Participants' Address List	147
E	Working Groups' Visual Presentations	151

PARTICIPANTS



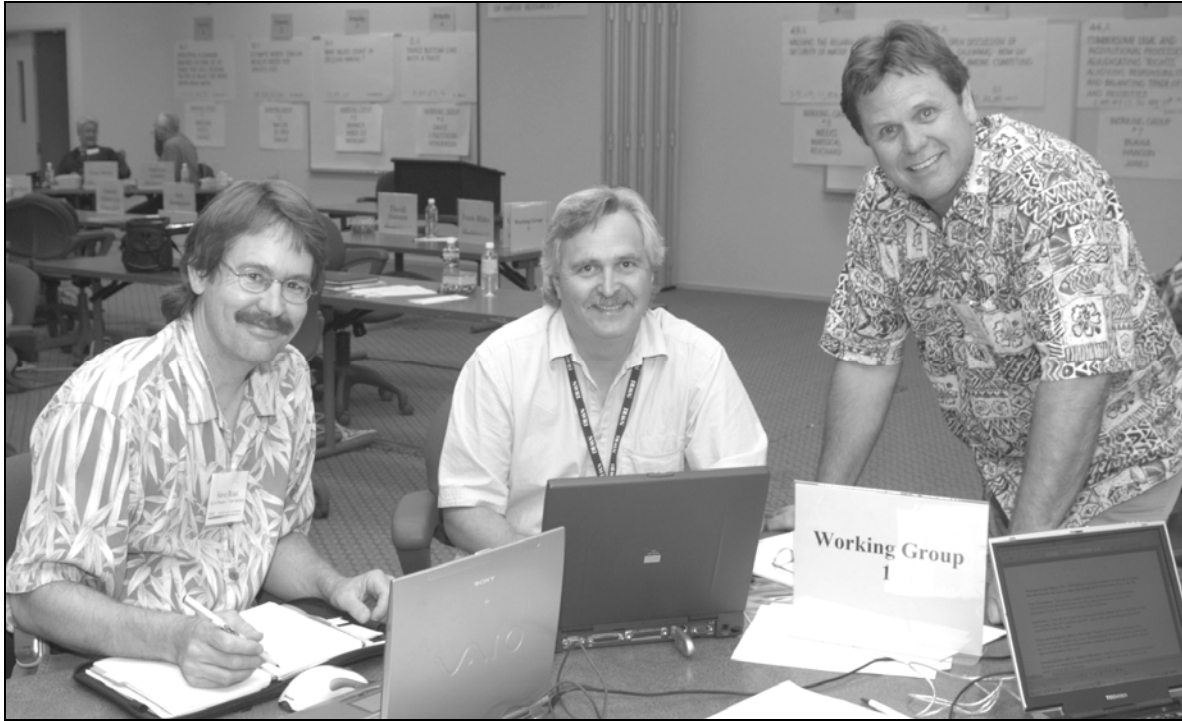
Top Row: Cheryl Davis, Annette Huber-Lee, Gina Melin (Editor), Helen Fickensher (Word Processor), Linda Harp (Word Processor), Mary Renwick, Bob Raucher, Moya Lyttle (Word Processor), David Hanson

Standing: Bruce Macler, Jason Weeks, Brian Hurd, Jim Henderson, Bret Weingart, Frank Blaha, Eric Reichard, Tim Hogan (Graphics Assistant), Barbara Close (Graphics), Kris Lindstrom

Seated: James Moncur, Cynthia Jones, Maria Mariscal, Susan Trager, Ed Means, Bill DeOreo, Patricia Linsky (Editor)

Floor: Steve Rossi, Brian Brady (Secretary), Tammy Russo (Word Processing Coordinator)

WORKING GROUP REPORTS



PRIORITY 1

Develop a Common Parlance (a Clear Set of Terms) That Will Describe the Type of Values That People Derive from Water

WORKING GROUP MEMBERS:

Means, Raucher, and Rossi

Issue Description:

People with different backgrounds, belief systems, and interests value water in different ways. We need to ensure that technicians, decision makers, and the public do not speak past each other. Ultimately, making good public-policy decisions about water requires that the value terminology be clear and reflect what the public, decision makers, and water professionals perceive.

The taxonomy is intended to be broad and all-inclusive, reflecting “values” regardless of whether they are amenable to quantification or monetization. Examples of value terminology categories include:

- *Cultural Attributes:* Difference in perspectives of water value in various cultures, the extent to which water is revered, feared or ignored or integral to maintaining that culture’s lifestyle or livelihood (e.g., farming lifestyle), and values placed on preserving resources for future generations.
- *Spiritual and Emotional Values:* Religious, psychological, or other personal values derived from water and water attributes (e.g., waterfalls, bathing, public fountains).
- *Environmental Issues:* Endangered Species Act, Clean Water Act, Safe Drinking Water Act, ecosystem integrity, human habitat, open space, etc.; the value of water in providing habitat, sustaining wildlife, preserving species, and providing other ecologic services. Includes non-use values.
- *Recreational Issues:* In-stream and near-stream uses, including fishing, boating, swimming, hiking, camping, picnicking, etc.
- *Economic Development and Sustainability Issues:* Community and regional economic development, water to accommodate or spur growth, or water as a means of managing growth.

- *Institutional and Ownership Issues*: Public perceptions and trust regarding jurisdictional issues, water rights, regulatory compliance, planning authorities, land use, community identity, local control, role of private and public sectors.
- *Water-Supply Reliability*: Integrated water-resource strategies, customer-defined and understandable reliability targets, public involvement in determining reliability targets, contingency plans, water-supply security, quality reliability.
- *Infrastructure Reliability*: Capital improvement planning, system rehabilitation strategy, value of a reliable infrastructure.
- *Water Quality*: Values associated with attaining the desired water quality to achieve a range of household, local, regional, state, or federal objectives/beneficial uses of water.
- *Aesthetic Values*: Water for sustaining the urban aesthetic or culture value of enjoying golf courses, parks, gardens, and open space in urban, suburban or rural areas can be overlooked as water is allocated to more “noble” purposes, such as fisheries and habitat maintenance.

Importance:

Unless we can clearly identify and articulate how and why water has value, we cannot proceed to fully consider the full benefits or costs of relevant water-management options or decisions. We also need to consider how key attributes of water (e.g., quality, reliability) contribute to values, and we need to understand how the public ranks different services (e.g., values) in terms of priorities.

This will aid in public education, as well as give the public and all stakeholders ownership and help them understand the issues. Stakeholders should understand and hear one another.

Proposed Strategy to Address This Issue:

This is a multi-step process that could include:

Phase I:

- Establish a suitable framework for categorizing values (i.e., as drawn from welfare economics). Consider values associated with different water uses as well as different water attributes (e.g. reliability, quality, etc.).
- Conduct an NGT-style workshop with stakeholders, policy makers, economists, and other water professionals.
- Elicit input from focus groups/case studies with the public and stakeholders.

Phase II:

- Conduct a national survey to confirm and refine taxonomy and to obtain (and compare) rankings of priority value types from the public, utility managers, and public officials.
- Develop a guidance manual/taxonomy for assessing/identifying key value categories.

Phase III:

- Develop communication and public education strategies based upon project results. The communication strategy must consider water supply reliability trade-offs with different supply options, as well as demand management implications.
- Implement the communication and public education strategies (this could be a small number of region-specific and/or national-level applications).

Individuals Best Able to Address This Issue:

- Economists.
- Social scientists.
- Ecologists and other natural scientists.
- Engineers.
- Decision makers (utility managers and elected/appointed officials).
- Spiritual and religious leaders (e.g., Native American perspectives).
- Planners.
- Public attitude survey practitioners.
- Lay persons.

Budget:

- Phase I: \$225,000.
- Phase II: \$225,000.

- Phase III: \$100,000 to \$500,000.
- Total of all phases: \$550,000 to \$1,050,000.

Comments:

“Under the category of aesthetics or water quality, explicitly list taste, odor, color, and turbidity of water. All customers care, to some degree, about how their water tastes, smells, and looks. As written, this write-up does not reflect the emotional or aesthetic values that we derive from water: the relief of taking a shower, the pleasure of watching a fountain, and the pleasure of listening to flowing water. Please make the concept of pleasure and abundance explicit. The puritanical work ethic of the water industry seems to cause us to veer away from these objectives. People use water as an inspiration for music, art, poetry, and myth. I would like to see this explicitly noted. Culture could be something like the fact that Hispanics buy more bottled water. People clearly assign a spiritual value to water. Cleansing rites (e.g., baptisms, etc.) are used all over the world and have been over time. Similarly, many waterfalls and geysers are considered sacred places. While in the industry, we rail against the public for not valuing water. I believe that in reality they do – just not always in the way we value it. If the panel is constituted solely of the people we normally talk with, the product will look a lot like the products the water industry typically produces. If we are going to open up the definition of value, the first step is to expand the type of people participating in the discussion. A literature search could help locate artists, writers, or spiritual leaders who have thought about the psychological, aesthetic, and spiritual aspects of water. I would suggest investigating the articles produced in the Culture section of the World Water Forum in Japan (Kyoto, Osaka) in 2002. There was excellent material on music, art, etc.” – ***Cheryl Davis***

“Add ecologists/environmental scientists to the group of individuals best able to work on this issue.” – ***Annette Huber-Lee***

“Terms = Clear and modern language that is less technical and more common language. Input should also be gathered from political elected officials. These people become the middle persons for the public and the engineers. These officials will be using the new language.” – ***Cynthia Jones***

“Not considered was the underpricing of water in a direct way. Correct pricing – to full, comprehensive value of the water- will bring home to water users the impact of their habits and explicit decisions. Only when consumers face the full cost on a continual basis will they have appropriate incentives to conserve.” – ***James Moncur***

“Sacred/emotional/spiritual = Words to describe, and how these vary based on socio-economic characteristics and cultural backgrounds. Use a map to elicit feedback about how people name different ‘attributes’ and what they value. Need to increase the disciplinary breadth and world perspectives in composing the research team.” – ***Mary Renwick***

PRIORITY 2

Estimate the Monetary Worth (Dollar Value) of Water for Various Uses

WORKING GROUP MEMBERS:

DeOreo, Macler, and Trager

Issue Description:

We need approximate dollar values for water used for different purposes to give decision makers a way to compare and evaluate water-use alternatives. While such estimates will have caveats and ranges, they will provide alternatives to the “cost-of-production” information now commonly used. Water quality for each use must also be considered.

Value is different from price and cost. Value is the maximum amount one will pay for a specific use of water. Cost is the amount of money required to produce a specific quantity of water. Price is the amount that a producer charges the customer for the water after return on investment is considered. A safe generalization is that if the price to the user is greater than the worth of the specific use, the water will not be used. If the worth is greater than or equal to price or cost, it will.

The value of water must be related to “who” is using the water and “what” is the end use of the water because each use has a unique value. This should include information on users, uses, qualities, and quantities necessary for use, and value or worth for the water. Determination of value should not be confused with determination of cost of service. Valuation should include details on the full implications of the use, including so-called intangible values associated with the use. It also should include negative impacts and their costs resulting from the use.

Dollar values will help in rate-setting, allocation discussions, especially for environmental and recreational uses of water. Many values can be determined using traditional real estate appraisal approaches and by examination of economic data, such as elasticity and added values. Others are more difficult to determine because they are non-monetary in nature or because there is a societal reluctance to place a monetary value on them.

Importance:

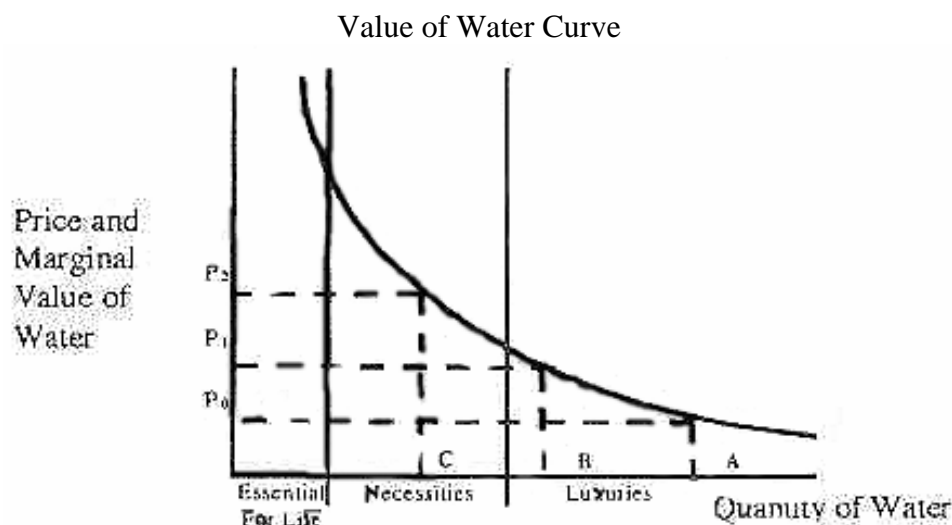
The valuation of water is of critical importance for water management and planning. In many cases, a limited water resource requires some management to determine how these water resources should be allocated. There are many uses of water. These include direct uses of water, such as for human consumption, sanitation, firefighting, manufacturing, gardening, landscaping,

and agricultural irrigation. There may be consumptive uses, such as gardening, or non-consumptive uses, such as sanitation, although the quality of the water may be altered substantially by the non-consumptive use. These also include indirect or non-consumptive uses, such as for swimming, boating, fishing or scenic viewing. In addition, the quality of water can be significant in valuing water for particular uses, in that some uses require water of specific quality. The volume of water may also be significant to valuation. For example, some rafters and kayakers require high flows for maximum enjoyment. Certain crops require high volumes for success.

Having valuation data for different uses allows for better strategic planning, usually for long-term activities. Measurements of value may be more useful than cost or price information, because these may change substantially as technologies evolve or availability varies. Not only that, information on willingness to pay (WTP) is essential for managers to determine how prices might impact demand.

Proposed Strategy to Address This Issue:

There are several good strategies for obtaining estimates of the value of water and making that data available for analysts. The best strategy depends on a range of factors, such as the type and place of use of the water. Irrespective of the type of use, however, all water-use values show the same basic relationship between perceived value and available supply, as illustrated below.



- ***Municipal Water Uses:*** When a municipal utility has extensive data on water consumption and costs, it is possible to develop elasticity curves, which show the responses of different categories of water customers to changes in the price of water. This information is very useful for estimating the value which customers place on water for particular uses. It could be made more useful if it were expanded and disaggregated by sub-category. That is, instead of a single curve for commercial users, individual curves should be developed for hotels,

supermarkets, offices, etc. Elasticity data can be expressed in terms of demand or value, each being the inverse of the other.

- *Traditional Appraisal Approaches:* Valuation of water for many water uses, such as agriculture and large commercial purposes, can be, and normally are, evaluated using traditional real estate appraisal techniques. The real estate appraisal approaches, which are market analysis techniques, use concepts of cost of replacement, and comparable sales. In more mature water markets, these techniques are the most applicable. A mature market is one in which exists a good history of arms-length transactions and relatively few regulatory constraints.
- *Econometric Methods:* For analysis of regional values, econometric techniques are often used. These rely on either economic impact or value-added approaches to create estimates of new supplies or avoided shortages in a regional economy.
- *Non-Monetary Approaches:* Often, cultural, social, religious, and environmental intangibles must be considered in a valuation process. In these cases economists and appraisers use a range of techniques, such as WTP, for recreation or water access in order place a value on the water. For example, the literature shows estimates of WTP for water-related recreation, such as swimming, at around \$24/day, or fishing at around \$35/day. This information can be combined with estimates of the amount of water needed to support the activity and the number of users per day to determine the volume and monetary value of water for that use.

We propose to use the various techniques described above to describe, estimate, validate, and catalogue dollar values for waters used for different purposes. Some of these may be difficult, if not impossible, to quantify with any precision but may be estimated with appropriate ranges and use of case studies.

The product of this exercise will be a compilation of a long list of uses for water. This catalogue will also include the users, details on quality and quantity needs associated with the use, and estimates (including ranges) of the value. This value can be based on WTP, or some similar approach.

Besides descriptive information for water use situations, data on WTP are available in existing literature and surveys.

The tabulated information should be validated against real-world situations. The catalogue can be supplemented with actual sales-transaction data.

An expanded version of the product will also include fuller descriptions of the uses. This may include alternatives and potential lost opportunities associated with specific uses. It should include details on the full implications of the use, including additional values or negative impacts associated with the use.

It would be appropriate to test the value information and its use in economic analyses of large-scale (e.g., regional, statewide) systems. This would provide a useful test of the

approach. Several possible allocation situations could be evaluated using value information to compare resulting net values.

Individuals Best Able to Address This Issue:

- Kris Lindstrom, K.P. Lindstrom, Inc.
- Ron Linsky, National Water Research Institute (NWRI).
- Bob Raucher, Stratus Consulting, Inc.
- Sandra Archibald, University of Washington.

Budget:

- An ongoing American Water Works Association Research Foundation (AwwaRF) project will provide much of this information.
- We proposed a follow-on NWRI effort to complete a detailed catalogue: \$100,000 to \$300,000.

Comments:

“I question whether numbers with any validity can be produced on a nationwide basis. As came up in the discussion, for the sake of convenience, the numbers could end up being very widely used in a number of situations. Unless the numbers bear scrutiny all over the country, this could be a problem, and I think it would be more valuable to do case studies on different approaches and use the numbers other people came up with in different places (unless you feel no one has done this and no one will). Willingness to pay is very location and situation specific. People are willing to pay more during droughts. People were willing to pay more in San Francisco during the Gold Rush than they were willing to pay now for water. I think values would be used for the sake of convenience, and the fact that values would vary so much by locality would cause it to be used in places where it did not work at all.” – ***Cheryl Davis***

“Possibly use ranges of value in place of a value.” – ***David Hanson***

“Water allocation decisions could be more responsive to relative worth, but must be mindful of property rights and fairness in the treatment of the owners of these rights.” – ***Brian Hurd***

“This process will be very subject for each city and local district. The demand curve will vary according to the cost and willingness to pay by each area’s interests and lifestyle.” – ***Cynthia Jones***

“The cataloguing of values is important, but the process of how they are determined (inputs) is also key. These can be identified by the literature review and a matrix showing the models and methodologies for each use.” – **Kris Lindstrom**

“The list of strategies and approaches was comprehensive. The proposed budget for projects may be a bit low for the work required. Although a ‘cookbook’ approach is not as customized as agencies would like to provide the estimated worth of water for various uses within their particular service territories, it will still be useful as a starting point or basis for comparison lacking any customized report.” – **Maria Mariscal**

“Increase budget to ~ \$500,000. Use case studies with examples to show how they are done in different areas.” – **Ed Means**

“Not considered was the underpricing of water in a direct of water in a direct way. Correct pricing – to full, comprehensive value of the water – will bring home to water users the impact of their habits and explicit decisions. Only when consumers face the full cost on a continual basis will they have appropriate incentives to conserve.” – **James Moncur**

“While it will be useful to develop a catalogue of ‘values’ as found in the literature (as a useful summary of literature) and provide broad ranges of the general dollar magnitudes found in past studies, there are very significant concerns about how these values may be applied inappropriately: values are often extremely site-specific (so that a value in a table may be wholly inappropriate to use in a specific application); there needs to be significant guidance and caveats, clearly provided, about how to use (or not to use) the values shown in the tables; and case studies may help reveal the dangers and benefits of using the values in the tables. This is not the stuff of a ‘cookbook’ approach.” – **Bob Raucher**

“The match between water-quality needs and specific uses is not static. For example, water that is currently perceived as having zero value for a specific use today may be usable in the future with new treatment technology. This needs to be taken into account in the estimation of worth.” – **Eric Reichard**

“Approaches to valuing – Need to better specify proper methods using appropriate terminology. For example, to estimate WTP, you often need to estimate a demand function. This can be done using two primary approaches: (1) indirect methods (estimate demand curve using econometrics, hedonic model, etc.); (2) direct method (contingent valuation – this is the only approach to estimate the WTP for non-market goods, such as the aesthetic value of a lake). The budget is grossly off – should be \$750,000. Transferability of results: \$/acre foot for drinking water is different from place to place.” – **Mary Renwick**



PRIORITY 3

Make All Values Count in Decision Making

WORKING GROUP MEMBERS:

Huber-Lee, Renwick, and Weingart

Issue Description:

Water is an asset that provides a wide range of benefits and services that people value. Water managers and policy makers increasingly look toward economic valuation to create an objective decision-making framework that places various uses in a common metric so that tradeoffs between uses can be compared. Some benefits and services, such as water used for drinking or irrigation, can be easily monetized; others, such as water for aesthetic and wildlife habitat, are much more difficult to monetize. Water used for spiritual practices, such as for ceremonial purposes, are extremely difficult, if not impossible, to monetize. Indeed, many people believe that it is inappropriate even to attempt to monetize such values.

Regardless of whether these benefits and services are monetized or not, it is clear that the full complement of benefits and services provided by a water resource has value to society and should be accounted for in the decision-making process. In practice, how much these benefits and services are accounted for depends upon the level of skill, diplomacy, and tenacity exhibited by utility managers and issue advocates as they engage in the water-planning decision-making process. Each community has some issues that are universal to utilities across the nation, such as water quality. However, each community also has some issues that are unique to its region, culture, and/or environment (e.g., meeting needs for wildlife habitat and tribal lands). Further, water managers continually face new challenges as new issues arise, and even the most educated water planners could benefit by learning more about the various perspectives held by members of the communities in which they live and work.

Utility managers need to solicit the assistance of “issue advocates” that are willing to educate community members. Issue advocates should play a key role in identifying, defining, and capturing the importance of the broad spectrum of issues that could arise in the water-planning processes. Utility decision makers can only appropriately consider (value) issues if they have been appropriately identified, defined, and “valued.” Although utility managers have routinely incorporated some level of financial and economic considerations into their water-planning and decision-making processes, an improved working-level understanding of these procedures would also be beneficial. Often, issue advocates have underestimated the degree of effort managers have made to include their issues and values in planning and decision-making processes. However, good intentions are not always sufficient, if the resulting projects are not perceived beneficially to some members of the community. Issue advocates need utility managers who are

willing to listen and learn about their issues and develop a full appreciation of its values so they are given legitimacy and equitable treatment in the planning and decision-making processes. Appropriate communication and partnering with each party affected by water planning ensures that *all* issues are more fully identified and fairly valued so community, decisions are most beneficial to each member of the community and negative consequences are minimized.

Importance:

Integrating and valuing community desires in the decision-making processes will improve support for water-planning initiatives and the respective outcomes. Customers are more willing to pay for those initiatives that they understand and perceive personal benefit from. For example, the citizens of San Francisco approved a referendum for a \$2 billion investment to improve water reliability to protect against a catastrophic seismic event that could cause damages in the range of \$10 to \$30 billion.

Current water-planning and decision-making processes rely on economic- and engineering-valuation processes to help improve decision making. However, some factors (values) do not readily lend themselves to economic- and engineering-evaluation processes. Yet, these factors/values may be considered very important to some community members. Failure to adequately account for and incorporate these values into the decision-making process has resulted in unanticipated negative social/cultural, economic, and environmental outcomes, thereby lessening community support for new water-planning initiatives. Participants at this NGT have shared a number of examples. One example is that the lifecycle of some fish species is negatively affected by temperature increases due to reservoir development. Some growing communities are struggling to remain on less-reliable, lower-quality, and limited water supplies, rather than contract with larger area cities that possess more reliable, higher quality, ample supplies because their leaders want to retain a separate identity. How can decision makers better account for these issues (values) in the decision-making process so that unanticipated negative outcomes are lessened or eliminated and the most effective, supportable community decisions are pursued?

Proposed Strategy to Address This Issue:

Integration of all these aspects can greatly complicate the water-planning and decision-making processes if water utility managers are not adequately prepared to handle this responsibility. Water utility managers need better training programs and materials to prepare them to successfully engage community issue advocates and appropriately consider their values in the water-planning processes. Utility managers and decision makers also need a better working-level understanding of the tasks involved in formulating the more traditional evaluation processes so they are comfortable extending beyond their traditional evaluation processes. Utility managers need to know how to:

- Identify, define, and capture the importance of all issues to be considered.
- Properly apply appropriate economic, financial, social/cultural, and environmental approaches in the consideration process.
- Establish equitable methods of considering all issues and values.
- Integrate competing issues and values into water-planning and management decisions.
- Persuade advocates with disparate views and expectations to better work together and integrate their issues, values, and contributions in ways that will result in more beneficial community water-planning outcomes, rather than counterproductive pursuits, such as competing for footing/advantage to stop or stalemate the decision-making processes.
- Identify quality-of-life issues and how to minimize the risks as an integral part of water planning.

The budding transdisciplinarily movement offers a unique approach to water resources that is holistic and inclusive. Transdisciplinary approaches emphasize integration across disciplinary boundaries and incorporate diverse types of knowledge and perspectives. Forming a consortium of scholars, practitioners, and issue advocates would be a critical ingredient to the developing a transdisciplinary approach.

Training efforts could include creation of professional development courses using a series of structured facilitation services, conference seminars, and internet tools. A benefit of using structured facilitation services is that issue advocates and utility managers can become unified during the initial educational efforts and gain a better appreciation of their respective positions during completion of the process. A neutral facilitator is a worthwhile tool to lessen the confrontational aspects of engaging issue advocacy groups and allowing utility managers to focus on communications rather than adherence to a new process.

Individuals Best Able to Address This Issue:

There are many sources of training (e.g., community universities, the American Water Works Association [AWWA] and AwwaRF, etc.). Additionally, a number of universities offer discounted or free facilitation and mediation services to governmental agencies seeking to engage public groups to resolve key policy issues.

Budget:

The cost for developing an internet-based-training effort, as described above, is estimated from \$500,000 to \$750,000. Approximately \$300,000 to \$500,000 would be for curriculum development with the remaining \$200,000 to \$250,000 for development of the internet-based training modules. Facilitation efforts can be obtained from \$200 to \$1,000 per hour. Mediation

is likely to cost \$2,000 to \$5,000 per day due to the amount of prior preparation and post wrap-up time necessary by the mediator.

Comments:

“An example of the type of issues for which this approach would be used would be helpful.” – ***Bill DeOreo***

“The definition of utility managers should include elected officials, board members, and even interested public groups. Hope there is a very subjective and humanistic feel to this guidebook for decision makers.” – ***Cynthia Jones***

“A model of ‘value’ should be at the generalized level – not specific – for the first approximation.” – ***Ron Linsky***

“The scope does not appear focused. Budget not defined sufficiently-disconnect from scope.” – ***Ed Means***

“Not considered was the underpricing of water in a direct way. Correct pricing – to full, comprehensive value of the water- will bring home to water users the impact of their habits and explicit decisions. Only when consumers face the full cost on a continual basis will they have appropriate incentives to conserve.” – ***James Moncur***



PRIORITY 4

Triple Bottom Line with a Twist

WORKING GROUP MEMBERS:

Davis, Henderson, and Lindstrom

Issue Description:

Traditionally, the concept of a “bottom line” for public water supply utilities has meant the financial bottom line of a particular organization. We often fail to identify costs and benefits relating to the environmental or social values. More recently, a new model for analyzing investment decisions and operational decision-making has been developed, which recognizes environmental and social values as two additional bottom lines. This analytical framework helps organizations do planning which takes into account the full range of water values, not only the economic factors. Objectives related to the social bottom line may, for example, include water supply and quality reliability, recreation, customer satisfaction with the aesthetics of water delivered, and social equity in constructing, purchasing, and personnel issues. Objectives related to the environmental bottom line could include protection of endangered species, restoration of wetlands or riparian habitat, recycling of water to avoid additional extraction of in-stream flows, and enhancement of fisheries.

The proposal of this working group is to add to the Triple Bottom Line analytical model (the Twist) by expanding the economic component to include not only the financial bottom line of the organization, but also the other economic values supported by the water (e.g., a region’s agricultural or industrial economy).

Importance:

This proposed methodology, if used correctly, helps ensure that performance goals are established in these three important areas. Using the Triple Bottom Line, we can account for factors that we do not know how to quantify. For example, recycled water may be overlooked due to the cost to the utility, even though the availability of a drought-proof source would not only be environmentally sound, but also support the economy as a whole. We often fail to analyze or discuss any factor (e.g., environmental or quality of life) that we cannot credibly quantify, and use of the methodology helps to fully account for environmental and social attributes influenced by water-management decisions that may be of local or regional significance. Use of performance measures to reflect achievement in these three areas helps ensure successful implementation of goals and objectives. Additionally, a clearer articulation of

our goals and performance measures will help us communicate more effectively both among ourselves (empowering organizational performance) and with the public.

Proposed Strategy to Address This Issue:

Using the Triple Bottom Line approach, which is broadly used in Australia, for making all major policy decisions involves three bottom lines: financial, environmental (not necessarily quantified, but identified), and quality of life or social issues (again, recognized even if unquantifiable).

The potential usefulness of this analytical model can be investigated using the following approaches:

- A literature search to summarize basic concepts, as well as applications to date (e.g., key Australian water utilities) and comparing it with alternative approaches, including ISO Standards and material produced by the Wharton and Drucker business schools.
- A workshop in which the results of this analysis could be presented, along with presentations by Australian water managers, researchers, environmentalists (e.g., the Sierra Club), and public officials who have successfully applied this and/or other models that take non-financial values into account. This workshop could also include a facilitated discussion with American water professionals on how this model could be effectively used in the U.S. An ideal forum for such a discussion would be a Sunday pre-conference workshop at the next annual conference of the AWWA.
- Commission the Australian Water Research Institute (contact name Andrew Speer) to provide background material on the Triple Bottom Line and guidance on its implementation.
- Selected utilities might pilot test application of the Triple Bottom Line. The training materials produced in cooperation with the Australian Water Research Institute could be used to help them successfully implement this approach.

Individuals Best Able to Address This Issue:

The literature search would identify the most qualified individuals to contact and invite to participate in the workshop.

Budget:

\$100,000 to \$500,000.

Comments:

“There must be many examples of use of this approach outside Australia. Try to find organizations in the U.S., Canada, and Europe, etc., who use the Triple Bottom Line approach.”
– ***Bill DeOreo***

“Triple Bottom Line can also play an important role in public education and awareness-raising of the broader implications of water management. Add to the section on ‘proposed ways to meet this issue.’ After the literature search, develop a few applications to U.S. utilities and present those at the workshop.” – ***Annette Huber-Lee***

“By using the Triple Bottom Line with a twist, an agency or project manager must be willing to address and possibly use a modified or different project. Contentious players should be invited to participate in practice workshops at your training sessions (e.g., Service Club, Bay Keepers, etc.).” – ***Cynthia Jones***

“Investigate what has been accomplished in similar enterprises at the Wharton School or Drucker School (Claremont).” – ***Ron Linsky***

“This approach was attempted on a large scale in the Calfed Bay-Delta negotiations. Users of water from many activities (e.g., agriculture, environment, recreation, and domestic) and all regions have attempted to integrate the financial, social, environmental, and related values to reach allocation decisions. It would be timely and appropriate to evaluate the success of this approach for Calfed. A difficulty in the approach comes from individuals and groups that represent particular points of view in the different bottom lines. They may be unwilling to collaborate or negotiate toward common goals. Still, the approach requires a broader and deeper inspection of a problem. This is always a benefit.” – ***Bruce Macler***

“Triple Bottom Line would also serve as a great forum to invite members of the public that would not historically be invited to the table to engage them into the discussion and the decision-making process.” – ***Maria Mariscal***

“The budget for literature review is inadequate. It should be \$20,000 to \$30,000 (unless an Australian researcher performs the task). Consider expanding to include ISO models.” – ***Ed Means***

“How will conflicts between the three (four?) bottom lines be reconciled? How do you ensure that, for example, a recycled water project, without an evaluation comparable to, say, a supply augmentation project or demand management project, is truly the best alternative? Not considered was the underpricing of water in a direct way. Correct pricing – to full, comprehensive value of the water – will bring home to water users the impact of their habits and explicit decisions. Only when consumers face the full cost on a continual basis will they have appropriate incentives to conserve.” – ***James Moncur***

“I like the distinction drawn between ‘financial’ and ‘economic’ components. In fact, this should be a ‘quadruple bottom line’ with financial, economic, social, and environmental as distinct components.” – **Bob Raucher**

“Could we get some experts in the Triple Bottom Line approach to develop a guidance document as an initial training effort?” – **Bret Weingart**



PRIORITY 5

Value the Reliability and Security of Water Supplies

WORKING GROUP MEMBERS:

Mariscal, Reichard, and Weeks

Issue Description:

Although ensuring water-supply reliability is an essential component of water-resource management, the value of this reliability has historically been subjectively defined. Water managers have a portfolio of water-resource management strategies available to them to ensure water-supply reliability, including demand management, recycling, desalinization, capital improvements, and conjunctive use of groundwater and surface water. These strategies will have different characteristics (e.g., water quality, access, cost) and may be interdependent. The more diverse the water resource mix, the greater the level of water-supply reliability; however, the development and implementation of these strategies can have a high dollar cost and require strong political and community support.

The public sometimes takes water-supply reliability for granted. They do not recognize the concept that water is a scarce and valuable commodity, which may be curtailed if due diligence is not practiced by water managers. To overcome public complacency regarding the importance of water-supply reliability, water purveyors need to emphasize continued water-resource supply planning and development not through a “sky is falling” approach, but rather, through a well planned, politically supported, systematic approach to water-resource planning.

It is to the water manager’s advantage to evaluate proposed water-supply reliability strategies in relation to their level of reliability and overall costs and benefits to the region. Clearly, understandable identification of these costs and benefits would greatly aid communication with the public and improve water-resource planning.

Importance:

Stakeholders must agree on the value of increased reliability to more effectively justify the cost of developing water-supply reliability strategies. One underlying aspect of improved reliability is maximizing the development of local water resources to ensure the continued health of the local economy. Another aspect that merits attention is the need to invest in heightened security measures and infrastructure improvements to ensure system reliability and integrity.

Proposed Strategy to Address This Issue:

- Conduct studies of public/customer WTP (or preference rankings) for reliability, based on plausible and comprehensible scenarios.
- Conduct studies of the economic costs of service disruptions, price spikes for imported waters, etc., that are consequences of not having adequate service/supply reliability. The potential local and regional economic costs of such disruptions could be devastating.
- Elicit the public's continued support for the development and implementation of water-supply reliability strategies, particularly during periods of water surplus.
- Assess the economic impact that previous curtailments have had on the local economy and use that information as a guide for estimating future impacts. This information can be used as an historical reference for current and future expenditures.
- Systematically delineate the characteristics and potential interactions of the water-management strategies (integrated water-resource management).

Individuals Best Able to Address This Issue:

- Water resource planners.
- State resource agencies (e.g., the California Department of Water Resources).
- AwwaRF.
- Municipalities.
- Stakeholders.
- Consultants/researchers (e.g., economists, public relations).

Budget:

Based on the tasks identified above, which could include case studies, costs would be approximately \$400,000 per local service area, based on a population of 3 million.

Comments:

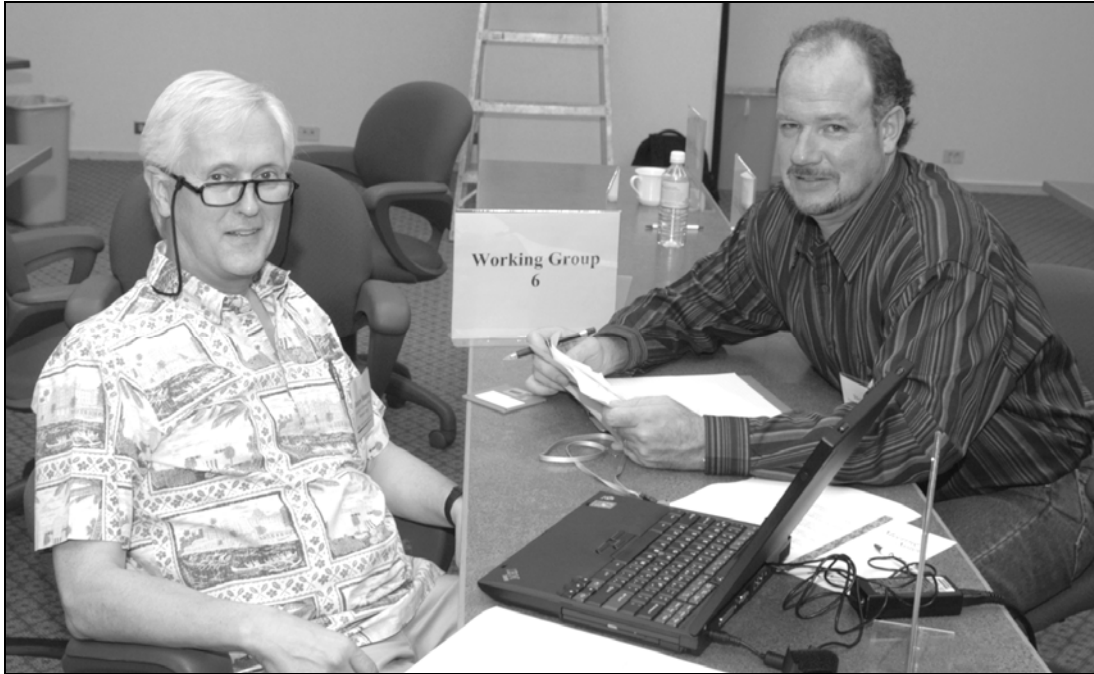
“Water utilities contribute to this complacency with their failure to communicate with their customers. Public relation campaigns and strategies would be helpful.” – ***Bill DeOreo***

“WTP studies should gauge a consumer’s relative importance of, for example, reliability versus wildlife protection, to get at underlying tradeoffs of limited agency monies.” – ***Brian Hurd***

“When the public is educated about the need, you may have success. Once a drought happens, everyone supports new water sources. Yes, rain falls from the sky – free. It just does not fall when and where we need it here in the world.” – ***Cynthia Jones***

“Not considered was the underpricing of water in a direct way. Correct pricing – to full, comprehensive value of the water – will bring home to water users the impact of their habits and explicit decisions. Only when consumers face the full cost on a continual basis will they have appropriate incentives to conserve.” – ***James Moncur***





Ethics and the Politics of Water: May the “Force” Be with You

WORKING GROUP MEMBERS:

Hurd and Moncur

Issue Description:

From Milton’s tome on a “Paradise Lost” to Mitchell’s lament of a “paradise paved”; from Copeland’s “Fanfare” (for the common man or, in our case, the common good) to Lucas’ *Star Wars*; from Aticus Finch to the sheriff in *High Noon*, the clock keeps ever ticking toward “twelve,” here in the desert, where democracy is tipped on its head driving out town’s good, and our heart goes out to the Sheriff willing to stick it out in spite of the failings of the common folk. Artists, poets, musicians, and writers have throughout recorded time been the cornerstone of culture, its myths, hopes, and fears. Mesmerized by the storylines and songs unfolding tales of unrealized possibilities, “would-a, should-a, could-a’s” from Aesop to the songsters of recent (e.g., Bob Dylan, Joni Mitchell, Beatles, and Talking Heads) and hip-hopsters of today (e.g., Dr. Dre and others far too hip for me to know) who raise our consciousness, share tales of the under- or mis-represented, and who feed our collective yearning for a better tomorrow.

It goes by many names: “enlightened self-interest”; good karma; the “light on the hill”; or the Spanish proverb “A dios rogando y con el mazo dando” (“Praying to God and with the hammer continue working” or hoping for a little divine intervention but not depending on its timely arrival.).

Here, too, in our desert lands dotted with more and more parking lots, verdant acres of green fields, and shrinking riparian corridors, we cannot hope that salvation will strike as if from Zeus’s thunderbolt – rather we must continually work and build it for ourselves, recognizing that our storyline is not finished and does not necessarily lead to the best possible ending. Many ethical and subjective, value-laden challenges confront the problems of stewarding our water resources. Challenges identified by our group include the:

- Accounting for the unvoiced interests of future generations and wildlife; and unheard voices of disenfranchised communities and the “silent majority.”
- Transparency in weighing the relative (and often subjective) merits of alternative public goals.
- Concentration of political power by prevailing dominant economic interests.

- Real and perceived conflicts-of-interests in public agencies and other assaults on the public's trust in government leaders and institutions.
- Masquerade of subjective and private interests under the cloak of "objectivity."
- Divide between the aspirations of planners and politicians who must provide the "vision" and those who must implement the plan.
- Identifying the public's vision for the appropriate balance of population growth and water availability and quality.

Importance:

Ethics are the moral "principles governing or influencing conduct." Ethical considerations surrounding the valuation of water refer to whose preferences count, whose welfare will be affected, and how these considerations are to be reconciled.

I take it as granted that what matters is the well-being of people, acting in broad and enlightened self-interest. It has been argued that animals, plants, and natural resources should also have inherent rights, but it is people who make decisions about living with plants and animals and using natural resources. People have concern for their families, their neighbors, for people less well off than themselves and for indistinct future generations. Several ethical considerations have been suggested:

- First, what uses should be included in valuation exercises? This question is at the heart of this workshop, and I think we can take it as given that all uses, current and future, extractive and in situ, market or non-market, financial or non-financial, have values and should be considered.
- Second are questions of income distribution. In terms of contemporaneous income distribution, water policy should not be driven by considerations of alleviating poverty; there are other and more comprehensive ways of dealing with this question. Nevertheless, it is a relatively simple matter to provide for basic water needs of those who are poor and to consider the impact on the poor of decisions we make (e.g., water rates they will have to pay). By the same token, water should not be re-allocated away from anyone, rich or poor, without full compensation.

Another type of income distribution question deals with intergenerational well being. Future generations cannot speak up for themselves here and now. Current decision makers directly or implicitly account for future generations by the choice of a discount rate. In technical terms, the setting of socially appropriate interest rates, by which to discount future costs and benefits, permits appropriate weighting of intertemporal interests. The rate chosen affects, for example, the durability of facilities built and the rates of groundwater depletion. The severity of consequences to future generations depends on our ability to make careful choices concerning discount rates.

- Third is a set of fairly obvious rules concerning conduct of water decision makers. Individual water board members, for example, should not take bribes or benefit themselves to the detriment of customers. They should not condone pollution to the benefit of friends. They must make trade-offs over whether to allow degradation of water, and how much to allow, to create or preserve jobs. Due to the pervasive third-party effects associated with water development or preservation, water allocation and quality decisions should be made in full public view and without regard to institutional spheres of power. Note should be taken that vested interests, whether favoring preservation or development of water resources, do not represent the preferences of the public at large, especially when the public at large, and not the vested interests, will stand responsible for the costs of the decision.
- Fourth, decisions should not be made without consideration of third-party effects. Assignment of property rights is a difficult and ambiguous matter, but imposing one's waste, for example, on downstream water users amounts to a theft of downstream users' rights, whether formally established or not.

Proposed Strategy to Address This Issue:

Even with the best of intentions, water managers are strongly influenced by short-term narrow perspectives on investment and resource use. An artifact of our political and economic institutions is the tendency to overweight short-term over the long-term gain.

How can society:

- Add clarity and light to the consideration of long-run interests?
- Guard against (and otherwise discourage) corruption and the polluting of the public interest by the greed of the privileged and powerful?
- Create well-reasoned goals that permit ground-truthing and feedback?

Directions identified by our group are to:

- Design institutions that foster and encourage public participation and reduce the likelihood of conflict-of-interest problems and corruption of public officials and processes.
- Educate elected officials and the public on the importance of considering longer-run consequences and a broader consideration of values.
- Build alliances of community-minded groups and individuals that can exert an illuminating influence on the public decision-making process.
- Develop transparent approaches for addressing subjectivity in making value judgments.

- Consider appropriate discount rates.
- Promote public awareness and vigilance through outreach in the media, education programs, and public oversight of important water resource matters.

Ethics arise from our homes, schools, and communities in which we all live. We need to practice “ethics” in our own lives and in the choices we make and to hold leaders accountable for the ethics in their decisions.

Individuals Best Able to Address This Issue:

- Environmental ethicist/philosopher.
- Economist.
- Educator.
- Communicator/media specialist.
- Selected water resource stakeholder(s).

Budget:

The most costly strategy will be the outreach effort to the appropriate and affected audience.

- Develop guidebook and training materials and tools.
- Implement a pilot program to gauge effectiveness and refine materials.
- Publish findings and outreach to the widest possible audience.

Approximately \$500,000 to \$650,000.

Comments:

“I really loved your presentation! I would suggest adding to the unheard groups the people who will be impacted by the decision who may have no control over it (e.g., damming a river in one country and reducing water available to people downstream). We need not only to include all of us but also consider them (i.e., whoever they may be in a specific situation). Please add: How can society provide tools and communication patterns, which allow open debate and discussion of ethical dilemmas? I would appreciate a more explicit recognition of the fact that we have to choose among competing goods and that often we face dilemmas where compromises have to be made and it is difficult to know exactly which weight should be reassigned to each factor.” –

Cheryl Davis

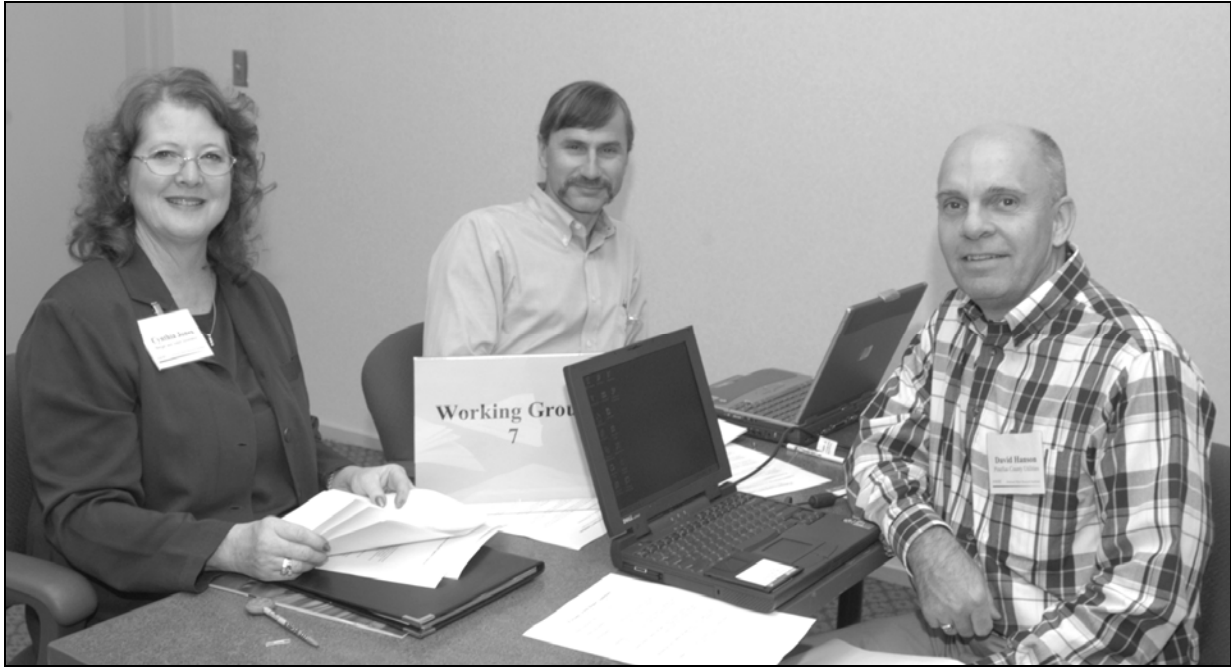
“I have heard it said that everyone is careful in business transactions to be sure he or she is not cheated, but an ethical person is careful to ensure that the other guy is not cheated.” – ***Bill***

DeOreo

“Good introduction; real attention-getter! How about soliciting public input on what they consider to be ethical issues/standards?” – ***Maria Mariscal***

“Scope not clear; no budget.” – ***Ed Means***

“Not considered was the underpricing of water in a direct way. Correct pricing – to full, comprehensive value of the water – will bring home to water users the impact of their habits and explicit decisions. Only when consumers face the full cost on a continual basis will they have appropriate incentives to conserve.” – ***James Moncur***



PRIORITY 7

Cumbersome and Complicated Legal Procedures That Inhibit Local Priorities and Economic Processes

WORKING GROUP MEMBERS:

Blaha, Hanson, and Jones

Issue Description:

Decisions involving water-resource issues often involve a large number of disparate “agencies.” Many of these agencies have a stake in local issues but are not well known to the populace at large. In addition, there are a number of elected government bodies, each with some type of authority over the decision. For example, many decisions may involve approvals by water authorities, state water regulatory authorities (such as state water resources authorities and state water quality authorities), river compacts, U.S. Army Corps of Engineers (COE), U.S. Department of the Interior, U.S. Department of the Interior, Bureau of Reclamation (USBR), U.S. Fish and Wildlife Services, upstream/downstream states, etc. It is in these circumstances that the decisions of each agency become fairly insular or the results are pre-determined through interagency agreements. It is when agencies act in singular ways, such as these, that most agencies will protect (and, possibly, seek and expand) their own authority and power. Because of these factors, the decision process is often one of piecemeal discussions and incremental decisions as the concerns and issues of each agency are addressed in turn.

It is also the view of many that regulatory institutions (e.g., U.S. Environmental Protection Agency [USEPA]) have ossified and want to stick to their rules whether those rules are efficient or even scientifically defensible. An example of this is the designation of specific microorganisms as indicators of fecal contamination at recreations beaches. The problem is that in tropical and sub-tropical areas these microorganisms occur naturally in the soil. Rain events wash these microorganisms from the soil into the water resulting in population levels high enough to close beaches, which can result in economic losses for a community. This is in contrast to evidence which shows that other organisms have been isolated that positively identify fecal pollution in tropical and sub-tropical areas. Despite this evidence, the USEPA is reluctant to tailor its regulations to local conditions.

Regulatory inefficiencies are not limited to national agencies. An example at the state level is where, to a greater or lesser degree in various states, property rights in water are ill-defined. As a result, it is difficult or impossible for an individual water-rights holder to transfer that right to another user or even another use, time of use, or location. Thus, the rights holder uses water

beyond the point of efficiency — potentially to the extent that its marginal value equals zero. In addition, water-right adjudications are long and costly (but sometimes necessary) endeavors to define the terms and conditions of ownership and its transfer. Right holders deserve fair treatment and compensation when their rights are abridged; however, rights come with responsibilities. Water rights and conditions for use need to be clearly described (e.g., further clarifications on the concepts of beneficial use and wasteful practices).

It is in these regulatory environments that local utility managers and boards operate. And just as state and national agencies are charged with protection of public health, so are local agencies tasked with protecting public health. A conflict occurs when local officials are often aware of projects that would produce more water-quality value if they were pursued first, rather than pursuing the projects demanded by new regulations. Local agencies find that regulatory efforts tend to have priority over projects that the community values more. The cost of these projects is borne by local rate-payers. It is the view of many at the local level that regulators make an invalid assumption that the community can pass a relatively unlimited amount of costs on to customers. What most large urban utilities find is significant numbers of customers have limited financial means. The ability to pay is a major consideration for urban utilities in the rate-setting process. These utilities must prioritize projects. Because of their less integrated capital planning approach, utility customers receive less value per dollar spent than they would if regulatory capital planning processes incorporated full water value considerations of the local utilities.

Another aspect is that cumbersome legal and institutional processes inhibit progress toward recognizing broader values, raise the costs of achieving better planning and management, and reduce the financial resources available for investing in asset sources of broader values. In short, the argument is that water is an inducement for growth, and regulatory impacts stifle the process. This rhetorical argument has been debated in most major water-resource development projects. This debate is emotionally charged and veers into discussions of population growth control, which has significant local, state, federal, and global sociopolitical implications.

There are also local dictates that affect the economics of water valuation. For example, water agencies are given direction to provide water at all costs for cities and developments. With resource limitations beginning to become more prominent, questions have begun to be raised related to the appropriateness of such dictates. Should there be an opportunity to reverse decisions if the costs are too high, or if there are ethical issues of concern?

Maybe part of the solution to current regulatory problems is to move this resource into a market environment. There exists a growing body of literature that demonstrates significant potential economic gains from trading water-using markets. Implied is that regulatory factors would become less of an influence. What we find currently is that institutional arrangements (transaction costs) influence the costs of reallocating water-using markets. Transaction costs substantially increase the cost of reallocating water to higher value uses and thereby inhibit reallocation.

Whatever process evolves in the future for achieving true water valuation, you can be fairly certain that regulation in some form will be a component. The comments above do not dispute

that. What they do say is that regulation needs to have the flexibility to accommodate local priorities in multiple situations without putting undue economic stress on local organizations.

Importance:

- Regulatory and local agencies try to produce projects that address local concerns. The overlying conflict is the accuracy of the solution to the problem is not always popular with all parties involved.
- A plethora of agencies involved in large water-related decisions result in a number of difficulties: time necessary for all parties to agree; widely varying perspectives and responsibilities making cooperative working relationships difficult; varying agencies, and concerns adding to the cost of projects when attorneys are involved. These difficulties result in delayed and over-budgeted projects and sometimes do not meet the original project description.
- Economic values are dissipated by the reluctance of regulators to recognize new science or new public preferences. Regulators, unlike private entrepreneurs, are not famous for their responsiveness to change in the circumstances they are supposed to be serving.
- Water has positive values in all its uses, yet people are reluctant to equate the value in terms of agriculture, urban, fishing, or aesthetics, to name but a few. Without a common unit of valuation for these uses, we have no rational basis for deciding on allocations between each of the interested parties.
- Customers become angry at utilities when resources are diverted away from community projects to comply with regulatory enforcement concerns.
- The economic market place as the birth of projects is also a minefield that can hold many surprises for the proposed project.
- Water as an inducement for growth is an emotionally charged argument. This issue is bound to become more complex given population growth, conflicting water-use needs, and urbanization.
- Values in conflict emerge in adversarial posturing, protracted litigation, and political grandstanding, often at the expense of tremendous public and private financial resources. Conflicts erode public trust and confidence, reducing investment resources, distract from common-ground concerns, and can worsen the legal and institutional process.
- Economic driven plans are not always the wisest plan. Is the ultimate cost to get the water an open ended proposition? This type of plan usually ends up in the political arena, and the fall out can be very wide spread. It is wiser to have as many stakeholders buy in prior to the cost incurred for the water.

- Transaction costs increase the costs associated with reallocating water.
- Advance planning does not always save a project from long and costly legal or cumbersome procedures. Advance planning done properly will prepare the stakeholders for challenges and help to form a more cohesive group to advance through all of the enviable problems.

Proposed Strategy to Address This Issue:

A new decision-making approach is necessary for addressing water valuation issues. A new, more defined, more comprehensive and more transparent decision-making process should be developed. This will be a process that identifies the basic steps to reach a decision involving water valuation that provides the opportunity for all stakeholders to voice their concerns and be involved in the final decisions. This new process is loosely based upon the Colorado Water Court system of dedicated people to become increasingly knowledgeable about water-related decisions. This process should meet the following general criteria:

- The process should be developed by a broadly representative consensus process that was well documented and advertised in a number of widely differing circles (including public advocacy groups, utility professionals, water resource experts, water law experts, environmental groups, city/state planners, economists, regulators, etc.).
- The process should be well developed, well explained, and well documented, establishing broad guidelines and performance criteria for decision-related activities, but must also allow for evolution and adaptation of water management approaches.
- The process should include well-defined general timeframes for decisions.
- The process is typically organized on a state-basis for most changes and decisions, but some regional groups would be necessary.
- Decision timeframes should have a sliding scale dependent upon both the quantity of water being discussed, as well as the severity of the anticipated change (e.g., more water being impacted or more significant change would require more time for the decision to be made).
- Involvement requirements would also be established on a sliding scale such that minimum notice requirements would be greater for greater change.
- Decisions would be made by a fairly small but broadly representative group, on the order of six to ten individuals, the Water Change/Use Jury.
- Minimum qualifications and experience requirements would apply to the people serving on the Water Change/Use Jury.
- Reasonable educational requirements would be specified to overcome qualification and experience deficiencies for the Water Change/Use Jury.

- Strict conflict of interest requirements would apply to all members of the Water Change/Use Jury.
- The Water Change/Use Jury would be charged with weighing and balancing the conflicting needs associated with water.
- Market forces and typical western water rights would be the broad framework for water use and administration, but the Water Change/Use Jury would provide for evolution of water use to generally allow for the greatest societal value of the water with risk minimization/ balancing a prime consideration.
- Decisions and deliberations would be well-documented.
- Decisions and deliberation would be a matter of public record.
- Decisions and deliberations would be binding and could over-rule individual regulatory authorities given certain procedural requirements.
- An appeals process would pertain for possible injured parties to re-visit a decision.
- Appeal of decisions made by the Water Change/Use Jury to a higher authority would be to the Court System.
- Considerable requirements would be attached to all appeals for any injured party to show true involvement and standing in the Water Change/Use Jury decision process.
- The positions on the Water Change/Use Jury would be compensated for meetings and time involved, through a known sliding fee system of reasonable charges for changes.

Individuals Best Able to Address This Issue:

- Laura Johnson, Supervisor of Water Reclamation
East Bay Municipal Utility District (EBMUD)
lajohnson@ebmud.com
Work # 510-287-2063 Fax # 510-287-1530
375 11th Street
Oakland, CA 94607
- Bert Michalzck, General Manager,
Dublin San Ramon Service District (DSRSD)
Work # 925-551-7320
bertm@dsrsd.com
7051 Dublin Blvd.
Dublin, CA 94568

- Dr. James Moncur, Director, Water Resources Research Center
University of Hawaii
- Dr. Brian Brady
Brian J. Brady and Associates
Irvine, California
- Dr. Mary Renwick, Senior Fellow, Economics and Water Policy, Water Resources Center
University of Minnesota
- Prominent federal legislator with some knowledge of water issues – do not know who this is.

Budget:

With the planning process, it is best to budget heavy in the beginning years, perhaps 50 to 60 percent or higher, depending on the nature of the project. The first few years involve gathering stakeholders, getting feedback, investigating possible legal challenges, and trying to anticipate any future challenges. As the project progresses, and concerns are encountered and, hopefully, addressed, the budget may be reduced for legal procedures.

Proper budgeting and thorough planning in the beginning will lead to a successful project. Failure to contact and involve all stakeholders in the process could result in heavy and expensive court and legal challenges toward the end of the planning process and even result in the failure of the project.

Each project is unique, and it is anticipated that each budget will reflect this fact.

Comments:

“An alternative approach might be to consider the downsides, impediments, and show stoppers, one-by-one, and to analyze the economic (and social) costs of just ignoring them. Some laws, regulations, and activities might have brick walls; ignoring them means no permit or jail time. However, some are so poorly enforced or have such minor consequences that they could be ignored. They may have some moral power, but not much beyond that. For example, most drinking water regulations can be ignored. There is relatively little enforcement; the enforcement is mostly public notice; and even fines are minimal. It is to the utilities credit that they obey them. A listing and ranking of the impediments and downsides could be done. This could at least allow prioritization of effort to address them.” – ***Bruce Macler***

“How about addressing conflicting rulings, policies, or procedures among the different agencies? How would the proposed jury respond?” – ***Maria Mariscal***

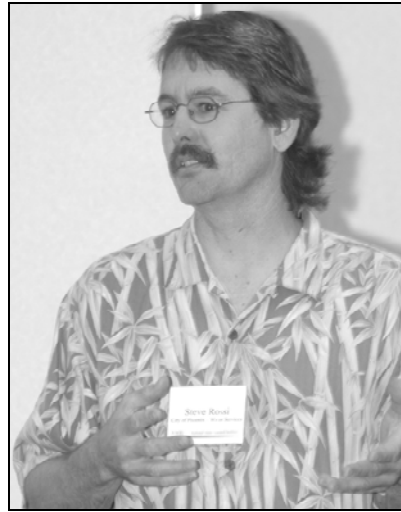
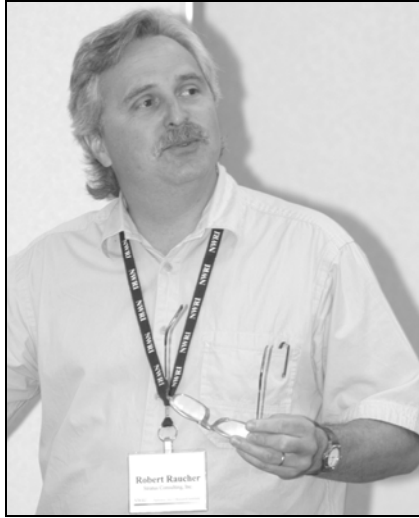
“Not considered was the underpricing of water in a direct way. Correct pricing – to full, comprehensive value of the water- will bring home to water users the impact of their habits and

explicit decisions. Only when their consumers face the full cost on a continual basis will they have appropriate incentives to conserve.” – **James Moncur**

“There is generally a disconnect between the attributes of the hydrologic cycle – the inherent linkage between different sources of water – and the agency jurisdictions, regulations, and legal statutes for dealing with them.” – **Eric Reichard**

“I believe it is a wonderful recommendation to propose centralization of the water regulatory and water-right allocation and management/administrative processes. Separately, the Water Court recommendation is also valuable. The jury component may be less useful; rather, it may be more beneficial to use a form similar to a Supreme Court made up of judges with appropriate epidemiology, engineering, economic, and other such disciplines. – **Bret Weingard**

NGT ROUNDTABLE



PRIORITY 1

Develop a Common Parlance (a Clear Set of Terms) That Describes the Type of Values That People Derive from Water

Originators:

Raucher on behalf of himself, Jones, Mariscal, Rossi, and Trager

The following issues were consolidated under the above title:

Title: **Develop a Common Parlance (a Clear Set of Terms) That Will Describe the Type of Values That People Derive from Water**

Originator: Raucher

Issue Description:

People with different backgrounds, belief systems, and interests value water in different ways. We need to make sure technicians, decision makers, and the public do not speak past each other. Ultimately, making good public policy decisions about water requires that the value terminology be clear and reflect what the public, decision makers, and water professionals perceive.

Importance:

Unless we can clearly identify and articulate how and why water has value, we cannot proceed to fully consider the full benefits or costs of relevant water-management options or decisions. We also need to consider how key attributes of water (e.g., quality, reliability) contribute to values, and we need to understand how the public ranks different services (values) in terms of priorities.

How Do You Propose Meeting or Resolving This Issue?

This is a multi-step process:

- Establish a suitable framework for categorizing values (i.e., as drawn from welfare economies).
 - Elicit input from focus groups with the public and stakeholders, possibly leading to a national survey.
 - Conduct an NGT-style workshop with stakeholders, policy makers, economists, and other water professionals.
-

Title: **Ultimate Water Mystery: An Understandable New Language of Water**

Originator: Jones

Issue Description:

- Technical terms shut out the public.
- A new language would open up discussions with the public.
- New definitions – easier to say and understand.
- Communicate with the public.

Importance:

This will aid in public education, as well as give the public ownership and help them understand the issues. Both sides should understand and hear one another (engineers versus the public).

How Do You Propose Meeting or Resolving This Issue?

- Use the media.
- Expose water issues through television, movies, and books.
- Write a mystery novel.

Title: **Overcome the Public’s Complacency and Perception That Water Reliability and Supply Are a Guaranteed State and Commodity, Respectively Speaking**

Originator: Mariscal

Issue Description:

Until the public recognizes that water-supply reliability is not 100-percent guaranteed and continues to support programs and policies that will ensure a high degree of supply reliability through the development and implementation of a mix of various water-resource strategies (i.e., demand management, recycling, desalinization, capital improvements, etc.), more harm will occur in the future due to this lack of understanding.

Importance:

This issue is important in that it ensures the public will not take water reliability for granted. Only with the public’s continued encouragement and support, both fiscally and politically, can water resource planners and professionals continue to implement policies and develop programs, that will ensure a high degree of water-supply reliability and obtain local supply control and independence. This needs to be stressed not just during drought periods, when the public would be expected to be supportive of water purveyors’ actions that would avert immediate health and fiscal harm to the public, but also during periods of water abundance, which serve as opportunities for water purveyors to regroup and re-evaluate their prior efforts, and to continue to adequately prepare and gear-up for the next drought cycle.

How Do You Propose Meeting or Resolving This Issue?

First of all, do not unduly alarm the public by repeatedly claiming water shortages when, in fact, shortages may not exist at the time the claim is made (the “crying wolf” syndrome); however, until the public accepts the concept that water is a scarce and valuable commodity, which may be curtailed if due diligence is not practiced by water purveyors, the public will continue to take water-supply reliability for granted. To overcome public complacency regarding water-supply reliability, water purveyors need to emphasize continued water-resource supply planning and development not through a “sky is falling” approach, but rather, through a well-planned, politically supported, systematic approach to water-resource planning.

Title: **While Money Does Not Grow on Trees, Water Does Fall from the Sky**

Originator: Rossi

Issue Description:

Water is, for the most part, seen as ubiquitous. Even though areas that are “precipitation challenged” (such as the Southwest) speak of the importance of preserving and conserving the resource, water industry and government leaders have done an excellent job of overcoming local scarcity through massive importation projects and new technologies. Because water is typically priced to reflect acquisition and other service costs, our culture has been built around the expectation that water will continue to be available at a price that allows our lifestyle to be unaffected. In effect, there is an expectation that when existing resources become stretched (due to drought and/or growth pressures), more water will be acquired to avoid any serious long-term consequences.

Importance:

The perception of the relative abundance of any resource is, perhaps, the key factor in determining its value. Despite periodic “gloom and doom” forecasts portrayed in the media, if customers continue to experience “abundance at the tap,” a disconnect will exist, and that which is experienced will dominate. As long as it is perceived that any threats to availability can be overcome through traditional means, it will be difficult to significantly affect the concept of value. Political futures are not made by emphasizing scarcity.

How Do You Propose Meeting or Resolving This Issue?

In terms that can be easily understood by elected officials, the public, and others, describe the availability of supplies, historic costs, and expected costs of acquiring new or replacement supplies. This should be described in terms of factors such as rates, tradeoffs between recreational amenities and growth, and the larger value that water provides to the area’s economy.

Title: **Urban Gardeners Should Unite**

Originator: Trager

Issue Description:

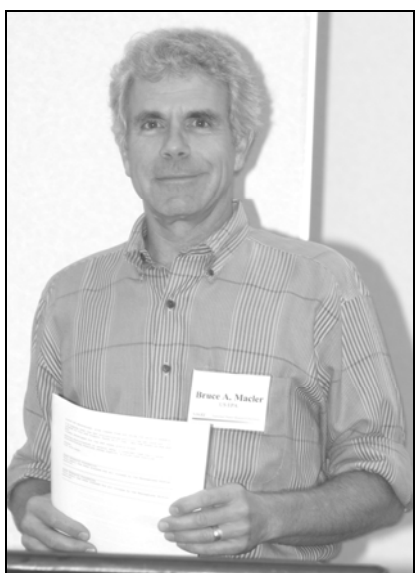
Most of us live in urban areas and value gardens. Yet, in the evolutionary expansion of the list of protected beneficial uses of water, the use of water to enhance urban living environments in desert areas has been overlooked and, to a certain extent, criticized. Water for sustaining the urban aesthetic or cultural value of enjoying golf courses, private and public swimming pools, household and community gardening, public landscaping, and green parks in urban areas, is not only overlooked, but subordinated to water allocated to more “noble” purposes, such as kayaking in distant places, fisheries, and habitat maintenance.

Importance:

People who live in urbanized areas need nature’s relief where they live, and not only in distant mountainous areas. People want to garden. They want trees in their neighborhoods. They need urban recreation areas, such as golf courses and parks where they live, for recreation or simply to view. Yet, during California’s Bay-Delta hearing process in the 1980s and 1990s, for example, the use of water for maintaining urban aesthetic values was subordinated to the use of water to maintain distant instream values.

How Do You Propose Meeting or Resolving This Issue?

- Give the use of water for urban aesthetic purposes its own label or identity.
- Elevate the value of the using water for aesthetic purposes by splitting it off from the existing categories of water use (e.g., municipal, industrial, agricultural, environmental).
- Institutionalize the value through legislative change and articulate the importance of using water to sustain urban aesthetics.



PRIORITY 2

Estimate Worth (Dollar Value) of Water for Various Uses

Originators:

Macler on behalf of himself, DeOreo, Renwick, and Trager

The following issues were consolidated under the above title:

Title: Estimate Worth (Dollar Value) of Water for Various Uses

Originator: Macler

Issue Description:

We need approximate dollar values for waters used for different purposes to give decision makers a way to compare and evaluate water-use alternatives. While such estimates will have caveats and ranges, they will provide alternatives to the “cost-of-production” information now commonly used. Water quality for each use must also be considered.

Importance:

What something is worth is often very different from its cost. Water is used for a wide range of purposes. Water qualities may be important for characterizing worth. Dollar values will help in allocation discussions, especially for environmental and recreational uses of water.

How Do You Propose Meeting or Resolving This Issue?

We need to describe, estimate, validate, and catalogue dollar values for waters used for different purposes.

Title: **Develop Alternative Allocation Scenarios for a Regional-Scale Problem Using Dollar Values for Different Water Uses**

Originator: Macler

Issue Description:

In regional negotiations on water allocation, such as Calfed, water resources can be used for various purposes. Dollar values for different uses can allow for better economic analyses of allocation alternatives; however, it is not clear that this approach has been attempted for regional-scale (statewide or multi-state) problems.

Importance:

Currently, arguments over allocations are usually based on costs or moral prerogatives. “Worth” should be more encompassing than “cost.”

How Do You Propose Meeting or Resolving This Issue?

Perform economic analyses of different Calfed (or other situation) alternatives using value estimates, rather than cost information.

Title: **Irrigation Water — \$5/1,000 gal;
Drinking Water — \$5000/1,000 gal;
Water for Your Kayak Course — Priceless**

Originator: DeOreo

Issue Description:

One reason why prices for water are out of line with their true value is that there are no mechanisms for translating damages to social and environmental values into costs to the end user.

Importance:

Municipal diversions may represent less than 20 percent of all water diversions, but are often more damaging due to their location, quality, and return flow patterns. Many of these could be mitigated by properly quantifying and assigning these costs.

How Do You Propose Meeting or Resolving This Issue?

- Dealing with these externalities is a proper role of government. I would try to find a county or regional authority to set up a pilot study.
 - Additional research on how to quantify external costs and identify opportunities for mitigation would be helpful.
-

Title: **Myths and Realities of Economic Valuation Approaches for Addressing Water Conflicts**

Originator: Renwick

Issue Description:

The total economic valuation of water offers great potential to identify and measure different uses (extractive, *in situ*, etc.), but this theoretical potential rarely becomes a reality because of the difficulty (if not impossibility) of measuring all values. This occurs for a variety of reasons (e.g., too costly to measure all values, failure to understand all uses, poor application of methods, lack of data, inability to measure, etc.).

Importance:

Need to explicitly recognize what values we can and cannot measure. Many water managers and decision makers assume that valuing different uses can be accomplished with relative ease. Valuation studies tend to be expensive, time-consuming, and site-specific. Capturing all the values – the complete suite of use and non-use values – of a particular water resource is extremely difficult, if not impossible.

How Do You Propose Meeting or Resolving This Issue?

- Need better identification of strengths and limitations of methods/evaluation approaches for addressing different types of water conflicts using valuation as a tool. Use examples of “good” studies versus “bad” studies.
 - Develop education materials.
 - Develop guidelines about conducting valuation.
-

Title: **Quantifying the Value of Maintaining Urban Aesthetics**

Originator: Trager

Issue Description:

- What are individuals willing to pay for water to maintain a green environment in an urban desert setting?
- How do we articulate values in a rate-setting proceeding?
- How much were the people of Santa Barbara willing to pay in terms of destroying their own landscapes to maintain their preferred aesthetic to keep out more growth?
- What effect will Rialto’s decision to stop irrigating its public areas make on its efforts to evolve economically from its status as an environmental justice community?

Importance:

Most people live and work in an urban setting. They are probably not aware of how important urban aesthetics play in their spiritual and property values.

How Do You Propose Meeting or Resolving This Issue?

- Articulate the value of water to maintain urban aesthetics.
- Quantify the value by using property valuation techniques.

PRIORITY 3

What Values “Count” in Decision Making?

Originators:

Renwick on behalf of herself, Huber-Lee, Rossi, and Weingart

The following issues were consolidated under the above title:

Title: What Values “Count” in Decision Making?

Originator: Renwick

Issue Description:

- What values are “counted” in the decision-making process when some are quantified and others are not?
- How do we set “weights” for different types of values (e.g., those we can quantify versus those we cannot)?
- How do we aggregate these diverse values?

Importance:

One of the main attractions of economic valuation is to create an objective decision-making framework that places various uses in a common metric so that trade-offs between uses can be compared. In practice, many values cannot be quantified (either from a lack of data, it is too costly, or simply impossible). We know these other values are important. So how do we “rationally” include them on an equal footing with quantified values?

How Do You Propose Meeting or Resolving This Issue?

Develop a transdisciplinary framework for incorporating and addressing diverse values. Transdisciplinary means moving across disciplinary boundaries and incorporating diverse knowledge and perspectives.

Title: **Who Cares? Prove That Value Matters**

Originator: Huber-Lee

Issue Description:

Values have been suggested as a guide in decision making in water management since the 1992 Dublin Principles; however, almost 12 years later, there has been little progress in using the concept of value in managing water.

Importance:

There is extensive evidence of underinvestment in water infrastructure. To change this, either the value of water needs to be better understood and appreciated, or a crisis will force the investment under duress and with inadequate planning.

One positive example, from the San Francisco Public Utilities Commission, is the value of reliable water in a seismic event. With improved infrastructure to handle a seismic event, the investments would be approximately \$1 to 2 billion, but the impact on the economy without investments would be approximately \$10 to 30 billion. This information was presented to the San Francisco Public Utilities Commission's public in the form of a referendum, and the public voted for the investment.

How Do You Propose Meeting or Resolving This Issue?

Through this project, show examples of how values matter in making better decisions.

Title: **The Objective in Defining Value Must Be Defined**

Originator: Rossi

Issue Description:

One premise behind recognizing the optimal value of water in planning and managing the resource is that planners, utilities, and government leaders will encounter less resistance from consumers toward price increases. This would ostensibly have the benefit of gaining more

support to enhance the availability, quality, and reliability of supplies. An assumption may also be made that increasing the perceived value will lead to increased efficiencies, which would in turn reduce the need for expensive alternative supplies; however, until the objective is clearly defined, this discussion is somewhat esoteric.

Importance:

The means to establish and engrain within our culture an increased value cannot effectively occur without clear objectives and justification. It can be argued that today's price does, in fact, reflect the value in the market. What we need to address is how sensitive this valuation may be and how quickly it could be affected by external events. This involves identifying the risk that such events could pose to our quality of life.

How Do You Propose Meeting or Resolving This Issue?

By better defining the need to establish increased water values, the means to do so will become more clear.

Title: **Water Utility Managers Need Better Training Materials to Identify and Cost the Components of Water Value and Quantify Opportunity Costs**

Originator: Weingart

Issue Description:

Most utility managers do not have a sufficient working-level understanding of the tasks involved in formulating a traditional cost of service and rate design. Attempting to refine, or further define, the components associated with the value of water without showing step-by-step procedures for converting this into a rate to be charged per 1,000 gallons of water will only exacerbate this problem. Utility managers need an improved knowledge of cost of service processes and the skill to apply procedures accurately. They need training to appropriately incorporate the full valuation concepts into rate-making processes. Policy makers and regulatory agencies need to become aware of these issues and support utility efforts to recover the full costs of water from users.

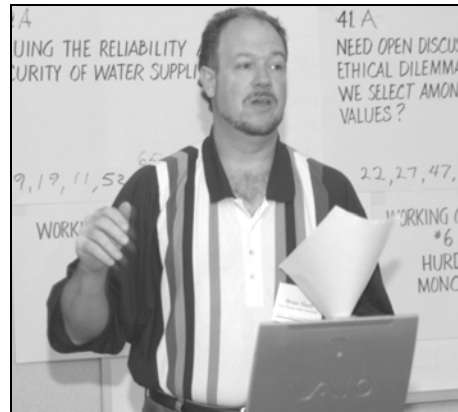
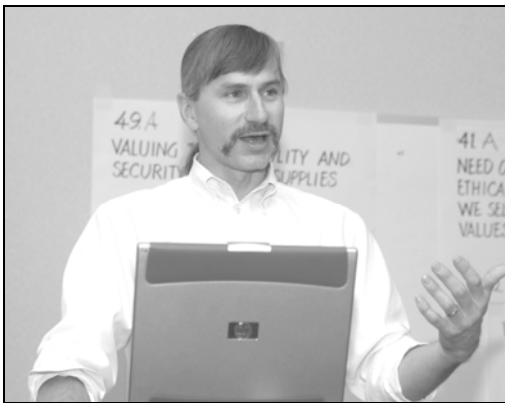
Importance:

If we want customers to respond to pricing signals, we need to ensure that the price we charge for water reflects the value of the water. Failure to incorporate the full costs into the rates

charged to customers will be revealed in lower returns and higher-than-anticipated costs over the long run. Fully reflecting the real costs into the rates charged allows a utility to better manage its financial solvency.

How Do You Propose Meeting or Resolving This Issue?

Create improved professional development courses using a vertical training approach (i.e., a series of classes) via the Internet. Far more actual training could be accomplished and at less cost.



PRIORITY 4

Triple Bottom Line with a Twist

Originators:

Davis on behalf of herself, Blaha, Hurd, Lindstrom, and Renwick

The following issues were consolidated under the above title:

Title: Triple Bottom Line with a Twist

Originator: Davis

Issue Description:

Currently, our cost-benefit analysis is limited on the financial side to the utility's balance sheet and does not take into account water's impact on the economy as a whole. We often fail to identify costs and benefits relating to the environment or quality of life. For example, taste and odor issues in water tends to be dismissed as significant factors because they are not health issues.

Importance:

We tend to fail to account for factors that we do not know how to quantify. For example, recycled water may be overlooked due to the cost to the utility, even though the availability of a drought-proof source would not only be environmentally sound, but also support the economy as a whole. We often fail to analyze or discuss any factor (e.g., environmental or quality of life) that we cannot credibly quantify.

How Do You Propose Meeting or Resolving This Issue?

I propose the general use of the Triple Bottom Line approach, which is broadly used in Australia, in which all major policy decisions are evaluated on three bottom lines: financial, environmental (not necessarily quantified, but identified), and quality of life (again, recognized even if unquantifiable).

However, I propose a Triple Bottom Line with a Twist, as my impression is that Australians typically use the financial bottom line solely in terms of the single organization performing the analysis. For us to make sound financial decisions, we need to look at the economic functions we support, and not just our own organization's balance sheet. Rather than pretend that unquantifiable factors are inconsequential or attempt to quantify the unquantifiable, we should take into account that in real-life decision-making, people use concepts and values for guidance. As an industry, we may be obsessed with numbers, but our most effective dialogue with the public will not necessarily involve numbers. We can and should take into account unquantifiable values.

Title: **Endangered Species Need Water, Too**

Originator: Blaha

Issue Description:

- Water resources are necessary to maintain endangered species.
- Both the timing and quantity of water must be correct.
- Strong laws exist for the protection of endangered species.

Importance:

The preservation of endangered species has become an important technical and political issue in water-resource decisions and is becoming increasingly important as untapped water resources diminish.

How Do You Propose Meeting or Resolving This Issue?

Develop tools for risk-balancing endangered species concerns with other societal values.

Title: **Imbedded or Hidden Values: Thorny Issues of Valuation**

Originator: Hurd

Issue Description:

Valuation can be a complex process, complicated by the generally embedded nature of water into our economy and lives. Like energy, water is a primary and essential economic input. Changes in water pricing will cascade throughout the general economy. Agricultural water use, for example, underlies our cost for food and food security. A cheap and stable food supply has been a key policy objective in the U.S. How much are people willing to pay for – or value – a cheap and stable food supply? How is this related to (imbedded in) the value and cost of agricultural water use?

Importance:

- The public likely under-perceives the role of water in the production and cost of their food; there is a direct and fundamental link between agricultural water use and urban consumers.
- Decomposing the value of water into specific categories or sources is much more complicated than it first appears.
- In the interest of total economic valuation and social cost accounting, it is important to capture imbedded values. For example, the value of food security is a primary social value and needs to be accounted for.

How Do You Propose Meeting or Resolving This Issue?

Care must be taken in the design of value measurement approaches for alternative uses.

Title: Recognize Natural Assets As Attributes That Provide Services and Value

Originator: Lindstrom

Issue Description:

Water managers need to inventory natural assets and try to account for them in management decisions. Examples include watersheds for flood control, habitat, scenic beauty, recreation, etc.

Importance:

This will help fully account for environmental attributes influenced by water-management decisions.

How Do You Propose Meeting or Resolving This Issue?

Look at forward-thinking models (e.g., Canadian and Australian governments) and education of decision makers and water managers.

Title: Myths and Realities of Economic Valuation Approaches for Addressing Water Conflicts

Originator: Renwick

Issue Description:

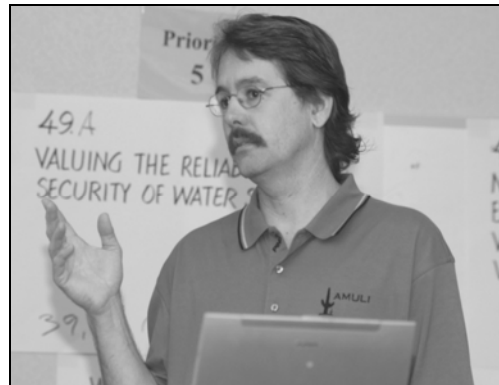
The total economic valuation of water offers great potential to identify and measure different uses (extractive, *in situ*, etc.), but this theoretical potential rarely becomes a reality because of the difficulty (if not impossibility) of measuring all values. This occurs for a variety of reasons (e.g., too costly to measure all values, failure to understand all uses, poor application of methods, lack of data, inability to measure, etc.).

Importance:

Need to explicitly recognize what values we can and cannot measure. Many water managers and decision makers assume that valuing different uses can be accomplished with relative ease. Valuation studies tend to be expensive, time-consuming, and site-specific. Capturing all the values – the complete suite of use and non-use values – of a particular water resource is extremely difficult, if not impossible.

How Do You Propose Meeting or Resolving This Issue?

- Need better identification of strengths and limitations of methods/evaluation approaches for addressing different types of water conflicts using valuation as a tool. Use examples of “good” studies versus “bad” studies.
- Develop education materials.
- Develop guidelines about conducting valuation.



PRIORITY 5

Valuing the Reliability and Security of Water Supplies

Originators:

Raucher on behalf of himself, Davis, Mariscal, Reichard, Rossi, and Weeks

The following issues were consolidated under the above title:

Title: **Valuing the Reliability and Security of Water Supplies**

Originator: Raucher

Issue Description:

The public has come to expect safe and ample quantities of water “on demand,” with no real experience or acceptance of possible disruptions in service (or seasonal water-use restrictions); however, reliability has a high cost (e.g., source development, infrastructure renewal, security activities, etc.). How much do customers value reliability?

Importance:

With large potential costs and capital investments often needed to provide reliability (and security), will customer WTP really support these actions? How much can we value storage (e.g., through conjunctive use, groundwater buffer value)? What “security” elements are valuable enough that the benefits outweigh the costs?

How Do You Propose Meeting or Resolving This Issue?

- Conduct studies of public/customer WTP (or preference rankings) for reliability, based on plausible and comprehensible scenarios.
- Conduct studies of the economic costs of service disruptions, price spikes for imported waters, etc., that are consequences of not having adequate service/supply reliability.

Title: **Need to Define Our Water Menu and Identify the Advantages and Disadvantages of Alternative Sources**

Originator: Davis

Issue Description:

Sometimes, water professionals take the stance that “water is water,” which overlooks the fact that different source waters are experienced much differently in terms of taste, odor, potential health impacts, and emotional appeal. They vary in terms of reliability of water supply, water quality, and access in times of emergency. They also vary significantly in their environmental impacts. We should differentiate between different water sources and water products (e.g., recycled water treated to different levels to fit use), and evaluate their relative costs and benefits in relation to planned uses.

Importance:

To the extent that we consider all water sources equal, as long as they meet regulatory standards, we overlook customer preferences and values. We also overlook key concrete differences. For example, in earthquake country, from an emergency preparedness point-of-view, water that is locally accessible is preferable to water that has to be transported from a distance.

How Do You Propose Meeting or Resolving This Issue?

Rather than vacillate between the poles of “water is water” and extremely technical analytical comparisons that are incomprehensible to most human beings, we need to develop water menus with different costs/benefits and different purposes.

For example, one source water might be excellent in terms of taste and cost, but less desirable in terms of reliability, not only in terms of supply and access (e.g., Hetch Hetchy water is transported long distances in transmission lines that cross earthquake faults). Another source water may be less tasty, but more accessible (e.g., local groundwater) in the event of an earthquake or other disruption to the water treatment and transmission system. Clear, understandable identification of these costs and benefits would greatly aid communication with the public and improve water-resource planning. We need to get beyond the fantasy that all water is the same and admit to the deficiencies, as well as the advantages of various water sources and water products. These advantages and disadvantages can be identified even in cases where they cannot be quantified.

Title: **Overcome the Public’s Complacency and Perception That Water Reliability and Supply Are a Guaranteed State and Commodity, Respectively Speaking**

Originator: Mariscal

Issue Description:

Until the public recognizes that water-supply reliability is not 100-percent guaranteed and continues to support programs and policies that will ensure a high degree of supply reliability through the development and implementation of a mix of various water-resource strategies (i.e., demand management, recycling, desalinization, capital improvements, etc.), more harm will occur in the future due to this lack of understanding.

Importance:

This issue is important in that it ensures the public will not take water reliability for granted. Only with the public’s continued encouragement and support, both fiscally and politically, can water resource planners and professionals continue to implement policies and develop programs, that will ensure a high degree of water-supply reliability and obtain local supply control and independence. This needs to be stressed not just during drought periods, when the public would be expected to be supportive of water purveyors’ actions that would avert immediate health and fiscal harm to the public, but also during periods of water abundance, which serve as opportunities for water purveyors to regroup and re-evaluate their prior efforts, and to continue to adequately prepare and gear-up for the next drought cycle.

How Do You Propose Meeting or Resolving This Issue?

First of all, do not unduly alarm the public by repeatedly claiming water shortages when, in fact, shortages may not exist at the time the claim is made (the “crying wolf” syndrome); however, until the public accepts the concept that water is a scarce and valuable commodity, which may be curtailed if due diligence is not practiced by water purveyors, the public will continue to take water-supply reliability for granted. To overcome public complacency regarding water-supply reliability, water purveyors need to emphasize continued water-resource supply planning and development not through a “sky is falling” approach, but rather, through a well-planned, politically supported, systematic approach to water-resource planning.

Title: **What Is the Role of Bottled Water?**

Originator: Reichard

Issue Description:

People spend a lot of money on bottled water rather than drinking water that they receive from their supplier. What does this say regarding their valuation of water? What are the implications for water management and regulation?

Importance:

The traditional chain of a drinking water supply has changed significantly. This provides information but presents challenges, including potential public health issues.

How Do You Propose Meeting or Resolving This Issue?

- Comprehensively evaluate reasons for bottled water use. Is there a correlation between bottled water use and characteristics of the local water supply.
 - Evaluate health effects (i.e., positive or negative) of bottled water use.
-

Title: **The Perception That All Water Is Not Created Equal**

Originator: Rossi

Issue Description:

Despite the fact that large surface-water sources throughout the country indirectly facilitate the use of reclaimed water, the pricing of directly delivered reclaimed water rarely reflects the cost of potable water. Reclaimed water has historically been associated with its origin, wastewater, thus making it theoretically of lesser value.

Importance:

Pricing between different source waters based on distinctions (such as “reclaimed water” and “river water”) instead of other factors (such as reliability and post-treatment quality) distorts the true value of the source.

How Do You Propose Meeting or Resolving This Issue?

This can be resolved by better establishing the benefits of reclaimed water as a source that can be more reliable than origin sources and as a source that, through technological advancements, can be brought to a higher quality level than origin sources.

Title: **Determine the Value of Groundwater Basin Storage to Assist in the Meaningful Evaluation of Projects**

Originator: Weeks

Issue Description:

Groundwater and groundwater storage are vital components of the water-resource portfolio for many areas of the country. The benefit of this resource goes beyond the cost savings compared to other sources of water, such as water imported from the Sacramento and Colorado rivers. Groundwater provides reliability, which should be quantified as a real benefit. Basin storage captures and reserves water during times of surplus to be used during times of shortage. Without quantifying these benefits, it is impossible to effectively evaluate projects and programs for a specific area. The components of the value of groundwater storage will likely vary from region to region; however, the underlying assumptions used in developing this value should be easily transferable.

Importance:

As the opportunities for developing surface storage facilities become more and more limited, the increased use of groundwater basins will become more vital. To more effectively utilize groundwater basins for storage, stakeholders must agree on the value of such a resource to more effectively justify the cost of developing the resource.

How Do You Propose Meeting or Resolving This Issue?

Solicit the opinions of the various stakeholders of a particular basin to determine the direct value of the resource to them. For the Central and West Coast Groundwater basins, stakeholders would include water rights holders, the California Department of Water Resources, Water Replenishment District of Southern California, and any other entities identified. A potential method of determining the value of the resources could be related to the avoided cost of developing such a resource.

Title: **Quantify the Impact of Imported Water-Delivery Curtailments or Cost Peaks to Local Economies**

Originator: Weeks

Issue Description:

Water-delivery curtailments, or price peaks, have a direct economic impact on local economies. This quantification will show the true value of reducing reliance on imported water and maximizing local water resources.

Importance:

As agencies ask taxpayers to fund such projects, the benefit derived from such a project should be clearly identified. Developing such projects will increasingly stabilize water costs.

How Do You Propose Meeting or Resolving This Issue?

Resolution of this issue will require the creation of working groups consisting of stakeholders and other interested parties. This working group should assess the economic impact that previous curtailments had on the local economy and use that information as a guide for estimating future impacts.

PRIORITY 6

Need Open Discussions of Ethical Dilemmas – How Do We Select among Competing Values?

Originators:

Davis on behalf of herself, Huber-Lee, Hurd, Jones, Means, and Trager

The following issues were consolidated under the above title:

Title: Need Open Discussions of Ethical Dilemmas – How Do We Select among Competing Values?

Originator: Davis

Issue Description:

In the water industry, we tend to pretend to ourselves and others that there is a rule, formula, regulation, or scientific test that provides the answer to every question. It is just not true. One of the reasons the public distrusts us is that we act like there is one right way and that we have figured it out.

Importance:

We tend to think in terms of “right” and “wrong” and are weak in our analysis and consideration of competing goods. For example, in budgeting for a water utility, how much funding should go towards protecting water quality? How much should go towards protecting environmental values and being good stewards? How much should be directed towards worker health and safety? Perhaps a higher investment in environmental stewardship, for example, raises the cost of water to low-income consumers.

How Do You Propose Meeting or Resolving This Issue?

We should expand our language and analytical framework to include an open discussion of competing goods and the ethical dilemmas that confront us in our planning and management of water resources. If we become more open and honest about the dilemmas we face as water professionals when we are trying to balance competing goods (rather than pretending to be all-

knowing gurus), our communication with the public may become more complex, but more effective.

Title: **Need to Recognize Intergenerational Considerations**

Originator: Davis

Issue Description:

Financial decisions are made based on the immediate present, rather than on long-term benefits and impacts.

Importance:

Maintenance is deferred on critical infrastructure when the focus is on keeping rates low today. We build cheaply rather than well, and then do not maintain what we have built.

How Do You Propose Meeting or Resolving This Issue?

Encourage ourselves, each other, and the public to be responsible adults. Sometimes, we in the industry pander to the natural desires of politicians to curry favor by keeping rates low. If we get better at explaining long-term impacts and provide community outreach, we may be able to create alliances that enable us to be advocates for future generations and not just current rate-payers.

Title: **Lack of Political Will: Consideration of Values Can Be a Threat to the Status Quo**

Originator: Huber-Lee

Issue Description:

Water management that takes values (including social, environmental, economic, and cultural values) into account is very likely to change the allocation of water. While this reallocation may be better for society as a whole, vested, more powerful interests may be negatively affected and, therefore, resistant to change. Without a broad understanding of the values and consequences of

re-allocations, including the potential for “payments” for reallocation, it will be very difficult to bring about change.

Importance:

Political will is necessary to make the kind of changes needed in increasingly water-scarce regions, particularly to take into account the needs of marginalized people (including future generations), as well as ecosystems in these regions.

How Do You Propose Meeting or Resolving This Issue?

- Media.
 - Education.
 - Intervention in highly contentious water conflicts.
-

Title: **Erosion of Public Trust and Ethical Standards Regarding Valued Public Resources (Whose Ox Is Being Gored?)**

Originator: Hurd

Issue Description:

Public trust and confidence in government are increasingly scarce. Scandals in corporate governance and governmental oversight demonstrate that vigilance is necessary to protect against misappropriation of public resources and values. Motives of government and industry leaders are duly questioned as the lines blur between public good and private excess. Even the motives and intents of so-called “resource guardians” are called into question when their actions are viewed as self-centered and lacking in public focus. Eroding public trust in systems of governance results in substantial barriers for the broader recognition of values, building consensus, and identifying appropriate public policies.

Importance:

Trust is the foundation of our legal and political systems of governance. Any and all efforts toward the “broader recognition” of values must be built on this trust. Loss of trust cuts deep at our institutional foundations, raises the level of conflict, and lessens the prospect of better public-resource planning and management.

How Do You Propose Meeting or Resolving This Issue?

I do not know. Recovering lost trust after repeated and severe betrayals may be at least as difficult at a government level as it is at the family level – and those wounds are often slow to heal. Trust is reborn by demonstrating a low tolerance for unethical behavior and self-enrichment at the public’s expense. Ethics arise from our homes, schools, and communities in which we all live. We need to practice “ethics” in our own lives and in the choices we make, and to hold leaders accountable for the ethics in their decisions.

Title: **Planners Plan; Water Agencies Find and Provide**

Originator: Jones

Issue Description:

Water agencies are given direction to provide water at all costs for cities and developments. Should there be an escape? A time to say the costs are too high? Do not be afraid to do the right thing.

Importance:

Economic drive: Is the plan always wise? Also, is the ultimate cost to get the water wise? Who should be the smart one? The issue usually ends up in the political arena – trickle-down theory.

How Do You Propose Meeting or Resolving This Issue?

- Educate elected officials and the public. Planners are usually appointed (they are not accountable—set parameters and rules).
- Do not hesitate to seek alternative sources (i.e., wastewater treatment plants through reverse osmosis).

Title: **Is Water-Supply Development the Population Chicken or the Egg? (Does It Cause or Accommodate “Growth?”)**

Originator: Means

Issue Description:

Water as an inducement for growth has been rhetorically debated in most major water-resource development projects. This debate is emotionally charged and veers into discussions of population growth control, which has significant local, state, federal, and global sociopolitical implications. An assessment of the merits of these arguments is needed to help impact the debate.

Importance:

This issue is bound to become more complex given population growth, conflicting water use needs, and urbanization.

How Do You Propose Meeting or Resolving This Issue?

- Articulate approaches for weighing the tradeoffs at the state and local community levels.
- Establish the desired level of state reliability (including the resource development timeframe).
- Establish and fund federal, state, and local plans for reliability. Manage populations within that framework.

Title: **Shame Element in Addressing Regional Groundwater Contamination**

Originator: Trager

Issue Description:

Remediation of groundwater contamination is sometimes delayed because the leaders of the affected community have strong ties to the polluters, or the polluter is an important employer in the community, or the polluter contributes significantly to the community's tax base.

Importance:

- Better measuring devices have resulted in a bigger list of emerging contaminants.
- Groundwater pollution is widespread, seriously impacts the use of a significant water supply, and triggers the requirement of treatment expenditures.
- The sooner the remediation of groundwater contamination is addressed, the more options become available.
- You cannot address the problem until you admit it. Yet, some community leaders remain silent, rather than articulate the problem and implement solutions.

How Do You Propose Meeting or Resolving This Issue?

- Community leaders must agree on priorities: Attain clean local water by revealing or admitting the contamination, or remain silent and avoid the shameful admission and blight on the community's asset.
- Community leaders must take steps to anticipate and head off the blight effect of widespread contamination by elevating the promise of the restoration of wholesome, available, and plentiful water.

PRIORITY 7

Cumbersome Legal and Institutional Processes for Adjudicating “Rights,” Assigning Responsibilities, and Balancing Tradeoffs and Priorities

Originators:

Hurd on behalf of himself, Blaha, Jones, Means, Moncur, Renwick, and Weingart

The following issues were consolidated under the above title:

Title: Cumbersome Legal and Institutional Processes for Adjudicating “Rights,” Assigning Responsibilities, and Balancing Tradeoffs and Priorities

Originator: Hurd

Issue Description:

Cumbersome legal and institutional processes inhibit progress toward recognizing broader values, raise the costs of achieving better planning and management, and reduce the financial resources available for investing in asset sources of broader values. For example, water-right adjudications are long and costly (but necessary) endeavors to define the terms and conditions of ownership and its transfer. Right holders deserve fair treatment and compensation when their rights are abridged; however, rights come with responsibilities. Water rights and conditions for use need to be clearly described (e.g., further clarifications on the concepts of beneficial use and wasteful practices).

Importance:

Values in conflict emerge in adversarial posturing, protracted litigation, and political grandstanding, often at the expense of tremendous public and private financial resources. Conflicts erode public trust and confidence, reducing investment resources, distract from common ground concerns, and can worsen the legal and institutional process (for example, through ad hoc or politically motivated amendments that stifle progress toward achieving a broader recognition of value in water planning and management).

How Do You Propose Meeting or Resolving This Issue?

- Promote leadership and vision among community and civic leaders, elected officials, and key stakeholder groups.
 - Disarm adversaries through mediated conflict resolution and streamlined judicial procedures.
 - Promote adaptive management and feedback mechanisms in the design and development of institutions and legal framework so that institutional changes can be built into the system to take advantage of, for example, better information, changing environmental conditions, and new technologies.
-

Title: **Patchwork Quilt of Involved Authority Agencies Complicates Decision Making**

Originator: Blaha

Issue Description:

- Decisions involving water-resource issues often involve a large number of disparate “agencies,” each with some type of authority over the decision. For example, many decisions may involve approvals by water authorities, state water regulatory authorities (such as state water resources authorities and state water quality authorities), river impacts, COE, USBR, U.S. Fish and Wildlife Services, upstream/downstream states, etc.
- Piecemeal discussions and incremental decisions often result as concerns, or the issues of each agency are addressed in turn.
- Many of these agencies are not well known to the populace at large, as well as the elected bodies, which can result in thinking, views, and approaches that are fairly insular to those on the agency or with already-established agency relationships.
- Most agencies will protect (and, possibly, seek and expand) their own authority and power.

Importance:

The plethora of agencies involved in larger water-resource decisions results in a number of difficulties:

- Lengthy time necessary to get all parties to agree.
- Widely varying perspectives and responsibilities, making cooperative working relationships difficult.
- Widely varying “constituencies” involved with each agency, making the involvement of all constituencies in the decisions much more difficult and expensive.
- Disparate issues and concerns, resulting in a high cost generally associated with working through an issue.
- Complex issues and groups, often making attorneys necessary at an early stage – again, increasing the cost and, potentially, the time for a decision to be reached.
- In the end, the large number of involved authority agencies, resulting in questions of value being largely subsumed to the responsibilities and authority of the involved agencies – none of which are likely charged with ascertaining the overall value of the water.

How Do You Propose Meeting or Resolving This Issue?

For larger water-resource decisions, it may now be time for a larger, more defined, more understood, more transparent, and comprehensive decision-making process to be created that would be followed for many different decisions.

Title: **Planners Plan; Water Agencies Find and Provide**

Originator: Jones

Issue Description:

Water agencies are given direction to provide water at all costs for cities and developments. Should there be an escape? A time to say the costs are too high? Do not be afraid to do the right thing.

Importance:

Economic drive: Is the plan always wise? Also, is the ultimate cost to get the water wise? Who should be the smart one? The issue usually ends up in the political arena – trickle-down theory.

How Do You Propose Meeting or Resolving This Issue?

- Educate elected officials and the public. Planners are usually appointed (they are not accountable—set parameters and rules).
 - Do not hesitate to seek alternative sources (i.e., wastewater treatment plants through reverse osmosis).
-

Title: **Is Water-Supply Development the Population Chicken or the Egg? (Does It Cause or Accommodate “Growth?”)**

Originator: Means

Issue Description:

Water as an inducement for growth has been rhetorically debated in most major water- resource development projects. This debate is emotionally charged and veers into discussions of population growth control, which has significant local, state, federal, and global sociopolitical implications. An assessment of the merits of these arguments is needed to help impact the debate.

Importance:

This issue is bound to become more complex given population growth, conflicting water use needs, and urbanization.

How Do You Propose Meeting or Resolving This Issue?

- Articulate approaches for weighing the tradeoffs at the state and local community levels.
 - Establish the desired level of state reliability (including the resource development timeframe).
 - Establish and fund federal, state, and local plans for reliability. Manage populations within that framework.
-

Title: **Property Rights Underlie the Efficient Use of Water**

Originator: Moncur

Issue Description:

To a greater or lesser degree in various states, property rights in water are ill-defined. As a result, it is difficult or impossible for an individual water rights holder to transfer that right to another user or even another use, time of use, or location. Thus, the rights holder uses water beyond the point of efficiency—potentially to the extent that its marginal value equals zero.

Importance:

At the root of this workshop is the notion that water has positive values in all its uses. Yet, we continually hear people reject the notion of equating its value in, say, agriculture or urban uses with that in, say, fishing or aesthetics. Unfortunately, we cannot avoid making judgments about how much water is needed to divert to farms, what level of quality to maintain, how much municipalities can pump, how much should be left in the stream or ground to satisfy current non-monetary values, and how much is needed to preserve for future generations. Without a common unit of valuation for these uses, we have no rational basis for deciding on allocations among them. All these decisions have consequences beyond water itself—funds devoted to water cannot be used, for example, on AIDS prevention, homelessness, or other private and social ills.

How Do You Propose Meeting or Resolving This Issue?

Whenever possible, markets should be established as the primary means of allocating water. As with virtually any commodity, markets require some degree of organization and regulation. Indeed, the third-party effects of water use make market supervision even more important than for most other commodities. Nevertheless, wherever markets can be instituted, they should be.

Private property rights underlie markets: to provide the proper inducement to use water, the use-right must specify that the rights holder may use the water, may exclude others from using it, and may transfer the right to another person. To prevent most third-party effects, the right should be specified in terms of consumptive withdrawal rather than total withdrawal.

Title: **Regulatory Inefficiency and Inflexibility**

Originator: Moncur

Issue Description:

Regulatory institutions (e.g., USEPA) have ossified and want to stick to their rules whether those rules are efficient or even scientifically defensible or not. For example, the USEPA has directed that recreational water-quality standards should be based on *E. coli* and several other organisms. Those organisms grow naturally in the soils of tropical or semi-tropical areas, with or without actual fecal contamination in the streams. Other organisms have been isolated that positively identify fecal pollution, but the USEPA is reluctant to tailor its regulations to local conditions.

Similarly, regulations tend to be national or statewide in scope and ignore the differences in local climates or resource bases.

Importance:

Economic values are dissipated by the reluctance of regulators to recognize new science or new public preferences (or the like). Regulators, unlike private entrepreneurs, are not famous for their responsiveness to changes in the circumstances they are supposed to be serving, and are far too considerate of status quo interests.

How Do You Propose Meeting or Resolving This Issue?

Laws need to recognize and provide for changes in knowledge over time, and for differences between locales in comparative advantages.

Title: **How Institutional Arrangements and Transaction Costs Influence Water Values**

Originator: Renwick

Issue Description:

Valuation implies willingness to compare uses and consider reallocation. There exists a growing body of literature that demonstrates significant potential economic gains from trading water using markets.

Institutional arrangements influence the costs of reallocating water using markets—known as transaction costs. Transaction costs substantially increase the cost of reallocating water to higher value uses and thereby inhibit reallocation.

Importance:

Transaction costs increase the costs associated with reallocating water.

How Do You Propose Meeting or Resolving This Issue?

Need improved institutional arrangements that provide sufficient protective measures, yet reduce transaction costs. This is a monumental task, but it could yield substantial gains.

Title: **Federal and State Regulatory Processes Should Better Consider the Full Range of Water Values So Highest Community Projects Are First**

Originator: Weingart

Issue Description:

Federal and state regulators are tasked with protecting public health. Local utility managers and their respective boards are also tasked with protecting public health. Local officials are often aware of projects that would produce more water-quality value if they were pursued first, rather than pursuing the projects demanded by new regulations. Regulatory efforts tend to have priority over projects that the community values more. Regulators make an invalid assumption

that the community can pass a relatively unlimited amount of costs on to customers; however, most large urban utilities have significant numbers of customers with limited financial means. The ability to pay is a major consideration for urban utilities in the rate-setting process. These utilities must prioritize projects. Because of their less integrated capital planning approach, utility customers receive less value per dollar spent than they would if regulatory capital planning processes incorporated full water value considerations of the local utilities.

Importance:

Customers may perceive water-quality concerns due to aesthetic or health reasons that could readily be resolved if it were not for the need to allocate limited community resources on projects they perceive as less valuable. Customers unfairly perceive that the utility is not properly addressing concerns when it is only allocating limited resources to avoid regulatory enforcement concerns.

How Do You Propose Meeting or Resolving This Issue?

Integrate local valuation criteria into capital planning and regulation development so that the most important water-quality projects are most timely pursued based on community support.



PRIORITY 8

Rate-Setting Strategies Have Distorted the “Value” Signal Being Sent to Customers

Originators:

Means on behalf of himself and DeOreo

The following issues were consolidated under the above title:

Title: Rate-Setting Strategies Have Distorted the “Value” Signal Being Sent to Customers

Originator: Means

Issue Description:

People value things that are rare and expensive. Water rates in the U.S. average approximately \$26 per month per household. This is substantially lower than power, telephone, gas, and cable television. In addition, water is generally very reliable in most communities. The low price of water does not reflect the true direct cost (let alone indirect costs) of acquiring and delivering the service/product. It is artificially cheap for two primary reasons:

- Water utilities sometimes spread costs across multiple revenue sources. These include rates or commodity charges, taxes, grants, connection charges, etc. Avoiding water rate increases by raising revenues outside of commodity charges is favored by cities and water utility managers. Public opposition to rate increases (especially in increasingly politicized local communities) is generally strong.
- Cities frequently use water revenues to support other municipal functions. While this is not generally allowed, cities have creative ways of extracting revenue from water enterprise funds to support general funding needs. Fund diversions of 5 to 20 percent are common. I have estimated that approximately \$750 million has been diverted from the nation’s utilities over the last 20 years. This is not publicized by utility managers (although most strongly disagree with the practice, but are reluctant to call attention to it). This number is eerily close to the infrastructure shortfall (that has been identified by the Water Infrastructure Network, USEPA, and the American Society of Civil Engineers). This infrastructure shortfall is estimated to double or triple the price of water over the next 20 years.

The other reality is that the U.S. utility model does not encourage significant conservation because of revenue impacts (again, consider fund diversion by cities). Significantly higher rates will reduce demands, which reduces revenues, which utilities/cities need. Reducing the volume of water sold reduces revenues, which requires rate increases (or budget cuts) to absorb. Again, utility managers (e.g., city managers and elected leaders) are not rewarded for rate increases. The rush is on for grants and getting others to pay.

In the meantime, the price of water has been kept artificially low; consumers will not value a product that is cheap and plentiful.

Importance:

Artificially low rates encourages water waste.

How Do You Propose Meeting or Resolving This Issue?

- Assess and calculate true costs to utilities.
- Publicize that cost (along with the subsidized rate).
- Assess and evaluate fund diversions in cities.
- Publicize the results.
- Make the public aware of the true cost.
- Publicize reliability, or lack thereof.
- Create the perception that this is expensive and not plentiful.

Title: **Give Us Water Budgets, Not Water Police**

Originator: DeOreo

Issue Description:

Bad valuation leads to bad rate structures—the number one obstacle to improved water-use efficiency. How does anyone expect water users to invest in water-efficient technologies when they are being charged rates like \$0.75 per 1,000 gallons of water?

Importance:

Utilities typically tend to look at just a few uses (e.g., irrigation and domestic) as conservation targets, but well thought-out rate structures would encourage conservation by all users through targets and water budgets for all users, including commercial, institutional, and industrial users.

How Do You Propose Meeting or Resolving This Issue?

Conduct a national study of the barriers to use water budgets as part of municipal rate structures.



PRIORITY 9

Lack of Public Awareness That Value Depends on Quantity; More Water Equals Less Per Unit Value

Originators:

Huber-Lee on behalf of herself, Hanson, Jones, Mariscal, and Weingart

The following issues were consolidated under the above title:

Title: Lack of Public Awareness That Value Depends on Quantity: More Water Equals Less Per Unit Value

Originator: Huber-Lee

Issue Description:

There is a steady stream of questions in the media and among decision makers about why water is not allocated to high-value industrial uses, rather than low-value agricultural uses. But it is quite likely that industry has the water it needs at that high value, and more water delivered to them would not result in the same level of “value.” In contrast, for the very poor, concerns about affordability are often misguided—for the small amounts needed for daily life, they can and often do pay higher per-unit prices than the wealthy. The marginalized people and ecosystem values are not adequately voiced or known to the public.

Importance:

Public awareness would inform the public debate about who or what receives what amount of water and of what quality. Current allocations are based more on who is more powerful, rather than what is the greatest value to society, including the poor, ecosystems, and future generations.

How Do You Propose Meeting or Resolving This Issue?

- Media outreach.
 - Work with stakeholder organizations to better inform the public about the value of water.
 - Provide evidence that considering values matters.
-

Title: **Education Interactions**

Originator: Hanson

Issue Description:

- Many speakers have noted the need for public education on the value of water.
- Usually, the value is communicated when a crisis is on the horizon and the communication is a public relations exercise (e.g., the organization is doing a good job, and the future crisis can be handled because of good management).
- In reality, there may be a crisis (e.g., monetary, resource, etc.) that the utility is having a difficult time coping with.
- The crisis is reported as a public relations crisis rather than as an organizational crisis.

Importance:

- Believability when an actual crisis occurs.
- The public does not view a crisis as a crisis.
- Administration fears of losing their jobs.

How Do You Propose Meeting or Resolving This Issue?

- Develop more transparency in organizational structure and processes.
- Better organizational planning.
- Emphasize organizational ethics above politics.

Title: **Education Is Key: When People Perceive the Need for Water Sources, Their Value Will Equal the Cost**

Originator: Jones

Issue Description:

Few people understand water, where it comes from, how much there is, and how much is needed for the everyday things we all enjoy. The public must come to recognize that the days of “traditional” water are over. The fact that we cannot all get our water from pristine rivers, lakes, and streams is the new story. There are alternative sources, and we need to be honest with the public about them. The quality of these new sources of water can exceed “natural” sources. The fact is that new water sources are needed, are real, and should be part of the new education – sort of like taking city kids to the farm to see where their food source comes from.

Importance:

Only through recognizing water scarcity and limited accessible supply will we be able to fully charge the public for water usage. We need to teach and educate everyone about the water they use and want to use. Let the public become partners in the knowledgeable pursuit of water sources.

How Do You Propose Meeting or Resolving This Issue?

- Use our media, story lines on television shows, movies, books for children, and classroom talks.
- Use our own media’s sources of expertise.
- Make water a common knowledge/topic.
- Develop a more user-friendly language (not quite so technical) and more fully explain the terms now being used.
- Water is water; it is beautiful and renewable, and we need to all take a part in continuing to explore new sources of water.

Title: Ultimate Water Mystery: An Understandable New Language of Water

Originator: Jones

Issue Description:

- Technical terms shut out the public.
- A new language would open up discussions with the public.
- New definitions – easier to say and understand.
- Communicate with the public.

Importance:

This will aid in public education, as well as give the public ownership and help them understand the issues. Both sides should understand and hear one another (engineers versus the public).

How Do You Propose Meeting or Resolving This Issue?

- Use the media.
 - Expose water issues through television, movies, and books.
 - Write a mystery novel.
-

Title: Water Is Cheap; Energy Is Not – Why Does This Dichotomy Exist?

Originator: Mariscal

Issue Description:

The public's perception is that water is or should be a cheap commodity; however, energy price fluctuations are more tolerated to a certain extent (excluding the period during the energy crisis). Any proposed water rate increases are viewed as being anti-business and anti-community.

Importance:

Until the true cost of water is appreciated, any proposed water rate increases will be viewed with suspicion and anger by the public. Because of this negative backlash, policy makers and leaders are leery of proposing rate increases.

Unlike the energy purveyors who have been very effective in obtaining regular rate increases with minimal community opposition, and understanding that different governing bodies oversee rate increases (i.e., public utility commissions versus local governing boards and city councils), water agencies need to learn how to better package and sell justifiable rate increases.

How Do You Propose Meeting or Resolving This Issue?

Emphasizing the true value of water with realistic pricing schemes and clearly communicating the negative impacts and ramifications to the public (if the necessary infrastructure is not developed and maintained) are keys to gaining public support. Do not scare the public or decision makers; however, clearly communicating the ramifications of the lack of water infrastructure development and maintenance is key.

Title: **Customers, Officials, and Utility Managers Need a Significantly Improved Understanding of the Complex Issues Associated with Providing New Water Supplies**

Originator: Weingart

Issue Description:

People generally require a minimum amount of time to develop an understanding of any issue. A more complex issue generally takes more time to process than a less complex issue. People often underestimate the complex costs and other components associated with obtaining and providing new water supplies. This underestimation can often lead people to believe that a water-supply issue is less difficult to resolve than it really is and, therefore, can be more quickly and simply resolved than actually possible. More readily achievable solutions that promise speedier and less costly implementation will be more attractive because decision makers are not aware of the true long-term costs. Options that may initially seem more costly and take longer to implement may actually cost less in the long-run and may better address society's water value issues.

A decision maker who proceeds with a water-supply selection with an under-appreciation of the true value of water will likely make a less ideal choice when viewed retrospectively. Future policy and decision makers are then "saddled" with these sunk costs as they implement the more

preferred long-term solutions. Utility managers often believe they are more informed than they really are when in the pursuit of new water- supply projects. Since decision makers often receive their primary information from utility managers, the decision-making process is less ideal. Most utility managers know of one or more system components that have been prematurely idled because subsequent capital decisions made these earlier capital components obsolete; therefore, the true cost of the earlier capital decision was really much higher than revealed at the time that the decision was made. If decision makers were more aware and utility managers better informed of the true costs associated with respective decisions, it can be reasonably assumed that more beneficial, long-term choices would be made.

Importance:

Utility customers often pay for the poor choices of their leaders. Total costs borne by customers should reflect the true value of water. Utility leaders who make better choices based on the true value of water will be able to provide more economically beneficial water. Customers will better support efforts that they understand and can benefit from.

How Do You Propose Meeting or Resolving This Issue?

Utility managers need to become more skilled in communicating their utilities' needs, the complex issues associated with water-supply planning, and the value components of water. They need the courage to present decision makers with more clearly defined choices between incremental (short-run) and long-run solutions, with value components incorporated. Generally, decision makers will make the best decision among those presented. Today, few options are presented with value-added information in the manner we are discussing in this AwwaRF project.



Information on Demand Elasticities of Water Use in Municipal Systems Is Incomplete

Originators:

DeOreo on behalf of himself, Henderson, Hurd, Means, and Weingart

The following issues were consolidated under the above title:

Title: **Information on Demand Elasticities of Water Use in Municipal Systems Is Incomplete**

Originator: DeOreo

Issue Description:

The value of water is really set by the amount that customers are willing to pay for a unit of water for a given use. This can be much greater than the price set by the utility. Not understanding this causes utilities to underprice their water and leads them to avoid dealing with externalities.

Importance:

Water utilities typically price their water on a very narrow cost-of-service approach. They try to avoid dealing with environmental externalities out of a fear that they will price themselves “out of the market.” If they understood the actual value that users place on water, they would be more willing to expand their definition of cost.

How Do You Propose Meeting or Resolving This Issue?

Review demand elasticity data, for a start. This would be followed by an extensive effort to generate new curves for all major categories of customers: single-family residential, multi-family residential, irrigation, and commercial, etc. This information can be used to generate elasticity-of-value curves by customer category.

Title: **Current Pricing of Water Often Does Not Reflect Long-Term Marginal Costs and Does Not Reflect True Value**

Originator: Henderson

Issue Description:

Prices or rates that reflect the marginal cost of supplying water result in more efficient allocations and uses of water. Prices set according to marginal cost better reflect the opportunity cost of investments foregone and can signal when new supplies are needed; however, historically, water has been underpriced. In agriculture, federal subsidies were given to support water projects that supply water and power toward irrigation districts. In municipal water use, utilities have traditionally priced water to recover the average cost of supplies. But, in an increasing marginal cost water-supply environment, this can undervalue current supplies and does not reflect the anticipated cost of the next water source to assist in planning.

Importance:

Correctly pricing water will help allocate water more efficiently and better convey the value of water.

How Do You Propose Meeting or Resolving This Issue?

- In a municipal water-supply setting, institute prices to reflect the marginal value of water.
- In agriculture, subsidies should be addressed in a policy forum. Power and water prices should reflect the full cost of supply.

Title: **Low Tolerance for “Far Away” Benefits; Strong Aversion to Immediate Costs**

Originator: Hurd

Issue Description:

“Broader values” are often derived from water services that are (or are perceived to be) distant in time, space, or concern to individuals and communities, whereas the investment costs to enhance these services are significant and immediate. Decision makers at every level are, therefore, reluctant to—and, perhaps, even suspicious of—allocating scarce financial resources at the “needed” or “appropriate” levels.

Importance:

Under-investment in assets that are the basis of such broader values tends to result from shortsightedness and narrow perspectives of value. Persistent under-investment will diminish and degrade the associated assets and services, resulting in foregone opportunities, lower total values, less social welfare, and, possibly, societal regret in the future.

How Do You Propose Meeting or Resolving This Issue?

Educate and inform stakeholders to:

- Build a broader community understanding of the sources and importance of such broader values.
- Improve the understanding of underlying physical relationships and consequences of their choices and behavior.
- Develop a greater sense of “shared responsibility” for stewarding the resources and maintaining the integrity of the underlying assets.

Title: **Integrate Customer WTP in Water Board Governance Decisions**

Originator: Means

Issue Description:

Board actions do not always reflect public attitudes. Increasingly, water boards are used as stepping stones to higher office. Rate increases provide convenient issues to gain political attention. A rate setting occurs in this political context. Decisions are not always informed by good customer WTP information and, instead, activists represent the various sides of the issue. Board decisions sometimes focus on short-term politics, as opposed to long-term resource management and rate issues, including infrastructure.

Importance:

The resource selection/rate setting is skewed and may not represent the “will of the people.”

How Do You Propose Meeting or Resolving This Issue?

- Develop a toolbox to assess customer WTP, as well as methods of presenting this information to decision makers.
- Develop methods to better align community values with the values of the governing board, management, and staff.
- Consider the minimum qualifications (skill sets) for sitting on water boards. This could establish seats for audit, finance, engineering, human resources, water resources, etc.
- Develop a model that could guide utilities to establish the ultimate objective for water reliability and quality, generate the rate impact, and assess WTP.

Title: **Water Utility Managers Need to Be Able to Better Measure Customers' WTP for All Components of Water Value**

Originator: Weingart

Issue Description:

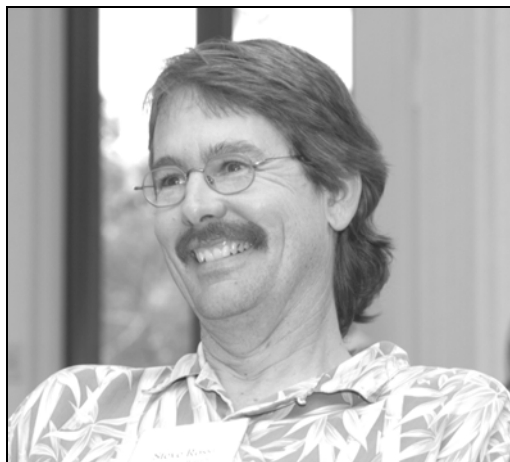
Customers do not universally hold the same values and have the same social desires; therefore, utility managers should not make invalid assumptions concerning customer support for supply options that may better address the full complement of water value components. Utility managers need to gauge the public's current water value knowledge and develop public educational initiatives to fully inform the public; however, after this has been accomplished, utility managers need to determine how well customers will support efforts to address these issues. For example, some communities have a strong recreational or wildlife protection ethic. Other communities may share these values, but not be willing to pay as much to preserve a recreational or wildlife habitat when such costs are revealed in the form of a rate increase; however, until these issues are quantified into "pocketbook" level points, like a rate increase, it is not truly apparent what the differences are between options.

Importance:

Utility managers should only pursue those efforts that customers will financially support over the long-run. Failure to accurately identify the true costs of options up front, and what value components are included in these options, can cause community unrest and a lack of support for future utility initiatives.

How Do You Propose Meeting or Resolving This Issue?

Utility managers need to become more engaged in the community and have ongoing public educational efforts. Utilities need to compete for the attention of the public they serve and have well-reasoned, concise, informative information so the community is a more knowledgeable buyer of the water good.



Politics and Human Nature in Water Value Determination

Originators:

Hanson on behalf of himself, Hurd, Mariscal, Renwick, and Rossi

The following issues were consolidated under the above title:

Title: Politics and Human Nature in Water Value Determination

Originator: Hanson

Issue Description:

People in a community already know that water is valuable. Usually, what they do not know is what that value is for themselves and for other members of the community (who may have different viewpoints). Many times, the value is only determined when people are pressed by circumstances into making decisions about selling or being “taken over.” At this point, a monetary value is usually assigned through the details of comparison, compromise, and concession.

This workshop is also discussing the details of valuing water. It is in this group’s nature, as logical engineers, scientists, and economists, to go through defined steps to find logical solutions for setting valuation.

It may be in our interest, however, to consider additional components that influence value. These other components occur in the not-so-logical worlds of politics and human nature—the worlds where human nature says, “It’s mine and I like it just the way it is” or “I won’t give it up because my political influence is bigger than yours.” It is in these circumstances that valuation is influenced by possession, emotion, and the fear of losing possession or the consequences of reduced possession. Two issues that challenge utilities include:

- How much is the value of water increased by political and emotional factors?
- How can those who have valuable water resources be persuaded to let those resources be “redistributed” for a higher and better use?

Importance:

Many locations in this country have communities in which a minority are “owners” of a high percentage of the available water. With an increasing need for water by a majority of citizens in a community, and with no new water sources available, a “redistribution” of water is a pressing issue. For everyone to feel that a fair and equitable resolution of redistribution has been achieved, both the logical arguments of valuation, as well as the not-so-logical components influencing valuation, will need to be resolved.

How Do You Propose Meeting or Resolving This Issue?

The following information would be beneficial:

- Determine “areas” that people view as valuable in the context of possession.
- Provide examples of win-win solutions that have been used to resolve these types of disputes.
- Include sociologists, psychologists, and/or political scientists on valuation teams.

Title: **Low Tolerance for “Far Away” Benefits; Strong Aversion to Immediate Costs**

Originator: Hurd

Issue Description:

“Broader values” are often derived from water services that are (or are perceived to be) distant in time, space, or concern to individuals and communities, whereas the investment costs to enhance these services are significant and immediate. Decision makers at every level are, therefore, reluctant to—and, perhaps, even suspicious of—allocating scarce financial resources at the “needed” or “appropriate” levels.

Importance:

Under-investment in assets that are the basis of such broader values tends to result from shortsightedness and narrow perspectives of value. Persistent under-investment will diminish and degrade the associated assets and services, resulting in foregone opportunities, lower total values, less social welfare, and, possibly, societal regret in the future.

How Do You Propose Meeting or Resolving This Issue?

Educate and inform stakeholders to:

- Build a broader community understanding of the sources and importance of such broader values.
 - Improve the understanding of underlying physical relationships and consequences of their choices and behavior.
 - Develop a greater sense of “shared responsibility” for stewarding the resources and maintaining the integrity of the underlying assets.
-

Title: **Overcome the Public’s Complacency and Perception That Water Reliability and Supply Are a Guaranteed State and Commodity, Respectively Speaking**

Originator: Mariscal

Issue Description:

Until the public recognizes that water-supply reliability is not 100-percent guaranteed and continues to support programs and policies that will ensure a high degree of supply reliability through the development and implementation of a mix of various water-resource strategies (i.e., demand management, recycling, desalinization, capital improvements, etc.), more harm will occur in the future due to this lack of understanding.

Importance:

This issue is important in that it ensures the public will not take water reliability for granted. Only with the public’s continued encouragement and support, both fiscally and politically, can water resource planners and professionals continue to implement policies and develop programs, that will ensure a high degree of water-supply reliability and obtain local supply control and independence. This needs to be stressed not just during drought periods, when the public would

be expected to be supportive of water purveyors' actions that would avert immediate health and fiscal harm to the public, but also during periods of water abundance, which serve as opportunities for water purveyors to regroup and re-evaluate their prior efforts, and to continue to adequately prepare and gear-up for the next drought cycle.

How Do You Propose Meeting or Resolving This Issue?

First of all, do not unduly alarm the public by repeatedly claiming water shortages when, in fact, shortages may not exist at the time the claim is made (the “crying wolf” syndrome); however, until the public accepts the concept that water is a scarce and valuable commodity, which may be curtailed if due diligence is not practiced by water purveyors, the public will continue to take water-supply reliability for granted. To overcome public complacency regarding water-supply reliability, water purveyors need to emphasize continued water-resource supply planning and development not through a “sky is falling” approach, but rather, through a well-planned, politically supported, systematic approach to water-resource planning.

Title: **Myths and Realities of Economic Valuation Approaches for Addressing Water Conflicts**

Originator: Renwick

Issue Description:

The total economic valuation of water offers great potential to identify and measure different uses (extractive, in situ, etc.), but this theoretical potential rarely becomes a reality because of the difficulty (if not impossibility) of measuring all values. This occurs for a variety of reasons (e.g., too costly to measure all values, failure to understand all uses, poor application of methods, lack of data, inability to measure, etc.).

Importance:

Need to explicitly recognize what values we can and cannot measure. Many water managers and decision makers assume that valuing different uses can be accomplished with relative ease. Valuation studies tend to be expensive, time-consuming, and site-specific. Capturing all the values – the complete suite of use and non-use values – of a particular water resource is extremely difficult, if not impossible.

How Do You Propose Meeting or Resolving This Issue?

- Need better identification of strengths and limitations of methods/evaluation approaches for addressing different types of water conflicts using valuation as a tool. Use examples of “good” studies versus “bad” studies.
 - Develop education materials.
 - Develop guidelines about conducting valuation.
-

Title: **While Money Does Not Grow on Trees, Water Does Fall from the Sky**

Originator: Rossi

Issue Description:

Water is, for the most part, seen as ubiquitous. Even though areas that are “precipitation challenged” (such as the Southwest) speak of the importance of preserving and conserving the resource, water industry and government leaders have done an excellent job of overcoming local scarcity through massive importation projects and new technologies. Because water is typically priced to reflect acquisition and other service costs, our culture has been built around the expectation that water will continue to be available at a price that allows our lifestyle to be unaffected. In effect, there is an expectation that when existing resources become stretched (due to drought and/or growth pressures), more water will be acquired to avoid any serious long-term consequences.

Importance:

The perception of the relative abundance of any resource is, perhaps, the key factor in determining its value. Despite periodic “gloom and doom” forecasts portrayed in the media, if customers continue to experience “abundance at the tap,” a disconnect will exist, and that which is experienced will dominate. As long as it is perceived that any threats to availability can be overcome through traditional means, it will be difficult to significantly affect the concept of value. Political futures are not made by emphasizing scarcity.

How Do You Propose Meeting or Resolving This Issue?

In terms that can be easily understood by elected officials, the public, and others, describe the availability of supplies, historic costs, and expected costs of acquiring new or replacement

supplies. This should be described in terms of factors such as rates, tradeoffs between recreational amenities and growth, and the larger value that water provides to the area's economy.



Impact of Water Quality on the Value of Water Is Difficult to Assess Due to a Suite of Dynamic Factors

Originators:

Reichard on behalf of himself, Henderson, Jones, and Weingart

The following issues were consolidated under the above title:

Title: **Impact of Water Quality on the Value of Water Is Difficult to Assess Due to a Suite of Dynamic Factors**

Originator: Reichard

Issue Description:

Water quality affects the value of water in terms of public health, ecological health, aesthetics, and public perception. Determining the long-term effects of water quality on water value is difficult due to several factors, including:

- New emerging contaminants.
- Ever-improving analytic capabilities.
- Changing regulatory standards.
- Ongoing development of new technologies (e.g., treatment techniques).

Importance:

The impact of water quality on the value of water is not static. What is considered “clean” water today may be considered “contaminated” in the future. Conversely, new low-cost treatment methods may increase the future value of today’s poor-quality water.

How Do You Propose Meeting or Resolving This Issue?

- Conduct retrospective case studies of how these changing water-quality factors have affected the use of water in specific areas.
 - Develop interactive valuation procedures that recognize these future uncertainties.
-

Title: **Water Uses Are Often Not Aligned with Water-Quality Requirements**

Originator: Henderson

Issue Description:

Potable water is not necessary for some uses, such as lawn or crop irrigation. Matching water quality with water use preserves the highest quality water for drinking and can free- up potable supplies to meet new high-valued uses. Matching quality with use and reusing water can have significant benefits to environmental values.

Importance:

The alignment of uses and quality can better reflect value and promote efficiency.

How Do You Propose Meeting or Resolving This Issue?

Develop water recycling capabilities, where appropriate, to match uses.

Title: **How Pure Is Pure?**

Originator: Jones

Issue Description:

We need to embrace water and all of its properties. Be aware that creating a population accustomed to pure potable water will eventually become isolated from the rest of the world and will be unable to travel to other countries. We will always find new elements in our water. Do

we truly need to protect our children from everything? It is said what does not kill you makes you stronger. Also, what you eliminate from our natural waters could save your life.

Importance:

Our worst potable water is superior to that found in developing nations. When we continue to address the public's request for purer water, we lose our connection with the rest of the world. It becomes harder and harder to recycle water. To address public concern, we are putting too many restrictions on recycled water uses. As a result, we are left with more byproducts to dispose of, or the cost is too high to produce the product. We need to educate and inform the public to accept purified water as a new source of water. The end product is more important than the source.

How Do You Propose Meeting or Resolving This Issue?

Educate the public—increase the public's ability to accept and understand water and recycled water.

Title: **How Safe Is Safe?**

Originator: Weingart

Issue Description:

We constantly focus on making drinking water as pure as possible rather than comparing its health effects relative to other goods consumed. We can agree that water should be safe to drink. But, not all of us would agree on what is considered safe water.

We need to define drinking-water safety in new ways that connote the values that our communities cherish. No one I know wants a baby or mother to have a higher incidence of getting sick from drinking water; however, many projects are pursued to meet regulations—though a typical customer or a utility manager cannot identify a direct link of these required projects to improving public health (i.e., fewer people will be sick, die, etc). Partly, this is because people do not sufficiently appreciate the technical issues involved in determining health effects and the ways to minimize them; however, current regulatory processes are far too separate from the community and its values. Additionally, regulators do not sufficiently identify and communicate the true benefits of these new regulations. If these benefits cannot be adequately identified, it should be questioned whether or not such regulations and their respective projects should be pursued. They are not improving value to the community they serve.

Importance:

A better appreciation of drinking-water safety will help us to understand the true value of drinking water and to support appropriate projects. It will also help us to avoid pursuing projects that do not add appreciable value to drinking water.

How Do You Propose Meeting or Resolving This Issue?

Reform the drinking-water regulatory process to incorporate community values on water safety.



Cultural Values Associated with Water Are Difficult to Capture/Quantify and May Not Be Rational

Originators:

Blaha on behalf of himself and Davis

The following issues were consolidated under the above title:

Title: **Cultural Values Associated with Water Are Difficult to Capture/Quantify and May Not Be Rational**

Originator: Blaha

Issue Description:

Water-resource decisions have typically been made based on those wishing to “develop” the water for a “beneficial use” and who also have some ability to pay for the resulting changes. Cultural values are difficult to capture and quantify in monetary terms, and so these values have typically received little consideration.

Water has values far beyond those typically recognized by water courts or industry as beneficial. Beneficial uses have historically meant diversion from the stream and put to some industrial or municipal use.

Importance:

No models appear to be available at this time that are comprehensive and effective at capturing these values.

How Do You Propose Meeting or Resolving This Issue?

We must start to study some of the specific sub-relationships that are critical to society and develop techniques for identifying and understanding societal values.

Title: **Indifference to Cultural, Emotional, and Aesthetic Values of Water: Water As a Product/Hazard Versus Water As a Blessing**

Originator: Davis

Issue Description:

Historically, the water industry in the U.S. has been dominated by engineers and by technical and financial considerations. Factors that are outside the personal knowledge and interests of engineers and technicians tend to be overlooked. Our lack of interest in the non-technical and non-financial factors distorts our priority setting and diminishes our ability to communicate effectively with the public.

Importance:

We overlook important factors in analysis and reduce our ability to communicate with the public, who view us as soul-less techno-geeks. We tend to treat water as a product or even a hazard, focusing on potential threats we can half-way measure, rather than taking into account aesthetic, emotional, and spiritual factors, which are distant from our expertise. Whereas people in all cultures and over time have experienced water as a blessing and have celebrated it in myth, poetry, religion, music, and art, we ignore all of these manifestations and try to communicate with the public about value only in technical, numerical, and financial terms.

How Do You Propose Meeting or Resolving This Issue?

I propose that we expand the culture of the water industry to incorporate and use the poetry, music, art, and religious practices that have reflected people's appreciation of water over different cultures and over time. (I have seen this done in other countries, such as Spain and Portugal—e.g. poetry in annual reports.) Rather than being frustrated by the public's inability to speak our language, we should expand our language to reach out to them.

I also propose that rather than being rigid puritanical conservationists, who think that valuing water means taking a shower with two drops of water, we embrace a concept of abundance that would be illustrated by the fountains and waterways in Granada. If we expand our water menu to include reclaimed and desalted water, we can provide people with the comfort and joy of free-

flowing water without damaging the environment by unlimited extractions of groundwater and surface water.



Involve the Historically Disenfranchised Communities/Publics into the Water Dialogue

Originator:

Mariscal

Issue Description:

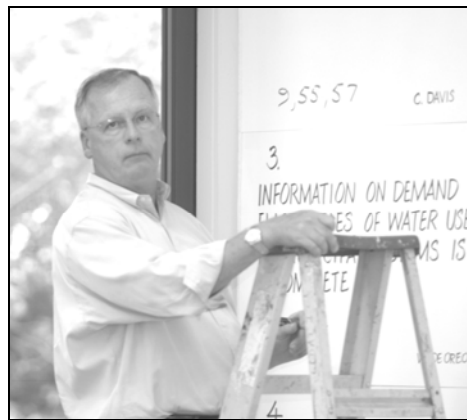
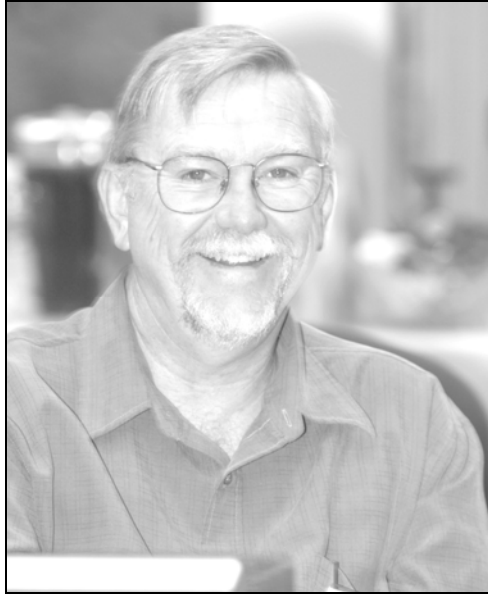
Water purveyors have traditionally had good communication with established water users, such as the business community and elected officials. However, other groups, which have not been historically approached or perhaps unintentionally ignored, are now beginning to bristle at this treatment, particularly if it will impact their specific communities or interests.

Importance:

Why is this communication important? Because it ensures project success. If you do not get community buy-in, or at least tolerance of a proposed project early down the line, the community most likely will not be supportive, especially if there is a perception of potential harm (via rate increases, receiving perceived lower quality water, etc.) to their communities.

How Do You Propose Meeting or Resolving This Issue?

- Meet early and often with these groups; avoid humoring or talking down to them.
- Respect their opinions and incorporate and address as many of their concerns into your project as possible.



Environmental Values and Sustainable Natural Resources Must Be Taken into Account and Quantified to the Extent Possible in Water-Resource Management

Originator:

Lindstrom

Issue Description:

Water-resource development and use have environmental consequences that are most often not considered in a long-term timeframe. The complicated interacting ways in which the natural environment can be impacted must be recognized.

One good example is the San Clemente dam on the Carmel River in Monterey County, California. This 70-year-old dam (970 acre-feet capacity) is no longer effective at storing water (i.e., 95 percent of capacity is lost due to siltation), blocks fish passage, warms river water, and is a seismic hazard. The consequences of future dams should consider examples such as this dam.

Importance:

This is needed to fully account for the true costs of water-resource development.

How Do You Propose Meeting or Resolving This Issue?

Literature reviews of case studies and materials showing links can be used to help water-resource planners and to educate decision makers.



Mismatch between Concerted Efforts of Advocates and the Dispersed Interests of the Public

Originators:

Moncur on behalf of himself and Raucher

The following issues were consolidated under the above title:

Title: **Mismatch between Concerted Efforts of Advocates and the Dispersed Interests of the Public**

Originator: Moncur

Issue Description:

Advocates of diversions, water projects, or regulations have strong incentives to push politicians toward their point of views, whether or not those views are best in terms of overall public welfare. For example, local panic about miniscule contamination threats or risks lead to lobbying for large projects funded by larger populations.

Importance:

We wind up diverting scarce resources to low-priority problems, and the benefits go to groups other than those who pay the costs.

How Do You Propose Meeting or Resolving This Issue?

- Educational processes.
- Public role for experts.

Title: **Account for the Distribution of Values; Recognize Who Benefits and Who Pays for a Water-Management Decision**

Originator: Raucher

Issue Description:

Many water-resource allocations and water-supply development plans generate benefits for people, locations, and sectors that may be different from those that bear the financial or social costs. For example, if benefits are fairly diverse and spread over many parties, but costs are more apparent and borne by a few, then good policies are likely to be derailed.

Importance:

Unless we know who receives the value, compared to who bears the costs, many water decisions may get derailed or steered in the wrong direction. Identifying who benefits (e.g., in what ways and by how much) can provide more support (e.g., political, economic, etc.) for many worthy water decisions.

How Do You Propose Meeting or Resolving This Issue?

Provide guidance and practical illustrations (e.g., for reuse, etc.) that water professionals can use to help identify, articulate, and engage beneficiaries; and to appreciate the burdens (e.g., costs) borne by others.



Water System Efficiency: Consolidation to Achieve Cost Reduction

Originator:

Means

Issue Description:

The network of water systems in the U.S. represents the vestiges of colonization over the last 200 years. Individual water systems were developed to provide the water-supply needs of individual communities. Over time, many of these systems have expanded as development has occurred. These systems are now contiguous, yet the governing, management, financial, administrative, and technical resources remain distinct. In some systems, this duplication represents an unnecessary waste of limited public dollars. With 55,000 community water systems in the U.S., consolidation of some systems should be considered. Generally, consolidation of public systems is fiercely resisted, often out of concern for preserving local control. The cost of this local control is seldom articulated but can include loss of the enterprise fund access, as well as loss of jobs when unnecessary staff positions are cut or phased out.

Importance:

- Limited public dollars must be carefully administered.
- Inefficiencies (whether public or private water systems) should be actively eliminated to free up resources to achieve other water needs (e.g., quantity or quality).

How Do You Propose Meeting or Resolving This Issue?

- Establish minimum “solvency” requirements that drive formal evaluation of consolidation opportunities.
- Establish incentives for cities to consolidate contiguous systems.



Who Controls the Services? The Public Versus Private Ownership Debate Must Be Considered and Resolved

Originator:

Lindstrom

Issue Description:

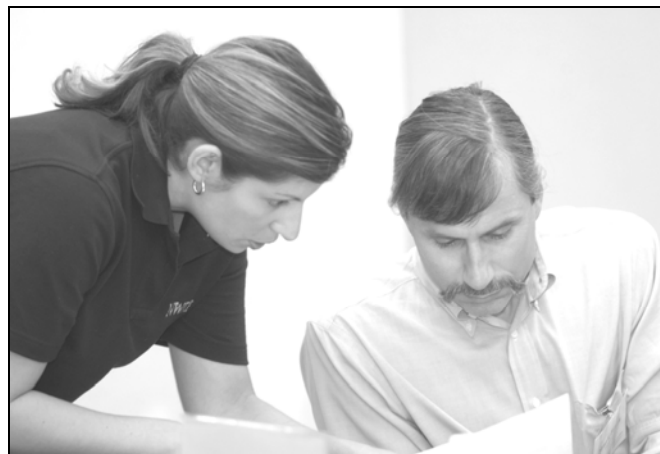
Whoever controls the water-supply service can have a significant impact on the value of water and determine how water-sale profits are invested. Do the profits go back into the community, or are they dispersed to shareholders?

Importance:

The issues of system improvements and environmental protection are affected by who manages the supply. Social and environmental values are often ignored by private owners and operators of water systems.

How Do You Propose Meeting or Resolving This Issue?

All government entities should consider keeping water-supply services in public ownership or control and maintain water as a public trust resource.



Need for Improved Long-Term Monitoring of the State of Water Resources and Their Uses

Originators:

Reichard on behalf of himself and Moncur

The following issues were consolidated under the above title:

Title: **Need for Improved Long-Term Monitoring of the State of Water Resources and Their Uses**

Originator: Reichard

Issue Description:

Informed quantification of water value and associated water-management decisions requires long-term data collection on the quantity, quality, and use of water supplies. These data must be incorporated into consistent, accessible, and comprehensive data bases.

Importance:

In many cases decisions/valuations may be made based on insufficient or outdated data.

How Do You Propose Meeting or Resolving This Issue?

- Consider long-term investment in monitoring/data collection.
- Integrate relevant separate data bases of individual local, state, and federal agencies.

Title: **The Value of Research in Water Resources**

Originator: Moncur

Issue Description:

The lack of markets for many water uses means that private entities have less incentive to uncover new technologies, institutional innovations, or the like. Thus, the research enterprise is much more the responsibility of public-sector agencies.

Importance:

How do we decide on the relative value of alternative avenues of research? Peer review? Competition among research organizations for research money from government funding or water utilities or foundations?

How Do You Propose Meeting or Resolving This Issue?

Who knows? Economics need to conduct the follow-up studies that physical scientists conduct routinely to enhance the certainty of results. Congress and legislators need to become more aware of continuity in research programs.



Insufficient Recognition of the Link between Surface Water and Groundwater

Originator:

Reichard

Issue Description:

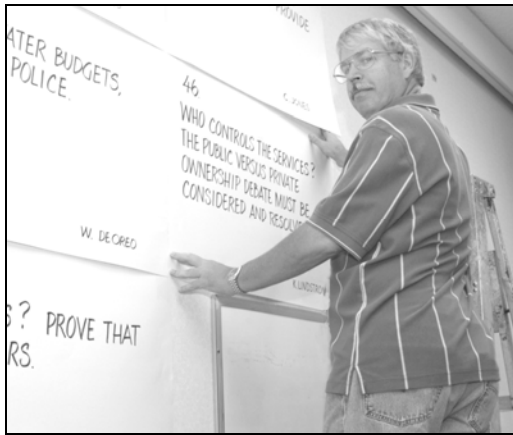
The values of groundwater and surface water are interdependent. For example, increased groundwater pumpage may result in decreased stream flow and reductions in ecological values. Another example is the case where lining a canal increases the efficiency of surface-water delivery but reduces groundwater recharge. This, in turn, reduces the value of the groundwater resource.

Importance:

Groundwater management decisions may result in unforeseen impacts on the value of surface water, and vice versa.

How Do You Propose Meeting or Resolving This Issue?

- Develop tradeoff curves or matrices to estimate how actions taken on one resource component affect the value of the other components.
- Encourage/require explicit consideration of surface water/groundwater interactions in resource-management decisions.



Rethink Clean Water Act Beneficial Uses

Originator:

Macler

Issue Description:

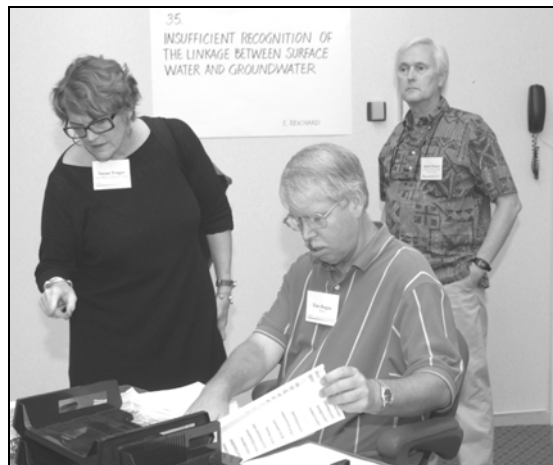
The Clean Water Act's beneficial uses define and direct water-quality standards and overall thinking on source-water protection: the water may be fishable, swimmable, but not necessarily drinkable. They are rather narrow in considering the protection of water uses.

Importance:

A broader view on the beneficial issues of the Clean Water Act will both direct resources and force changes to management decision-making approaches.

How Do You Propose Meeting or Resolving This Issue?

This would require very high-level political and regulatory/academic agreements to reconsider and expand implementation of the Clean Water Act.



STRENGTH OF FEELING ANALYSIS

The Strength of Feeling Analysis is a methodology that gives quantitative sense of the degree of agreement, or disagreement, among the participants regarding the importance of each identified issue.

Table 1 is organized according to the priority ranking by all 20 participants of all 21 major issues on which they voted. Also shown are the rankings and relative levels of agreement among the four categories of participants. The categories comprised consultants, utilities, researchers, and other.

APPENDIX A

ACRONYMS

AWWA	American Water Works Association
AwwaRF	American Water Works Association Research Foundation
COE	U.S. Army Corps of Engineers
NGT	nominal group technique
NWRI	National Water Research Institute
USBR	U.S. Department of the Interior, Bureau of Reclamation
USEPA	U.S. Environmental Protection Agency
WTP	willingness to pay

APPENDIX B

PREVIOUS NGT WORKSHOPS CONDUCTED BY NWRI

CALFED-Bay Delta Drinking Water Quality. Report of a workshop sponsored by NWRI in cooperation with CALFED Bay-Delta Drinking Water Quality Program and USEPA Region IX. Kellogg West Conference Center/Hotel, California State Polytechnic University, Pomona, CA, July 29-31, 2003. 239p.

Water Reuse Planning for the State of Washington. Report of a workshop sponsored by NWRI in cooperation with Washington State Department of Ecology. DoubleTree Hotel Seattle Airport, Seattle, Washington, May 30-June 1, 2003. 221p.

Seawater Desalination: Opportunities and Challenges. Report of a workshop sponsored by NWRI in cooperation with Metropolitan Water District of Southern California and Member Agencies. Kellogg West Conference Center/Hotel, California State Polytechnic University, Pomona, CA, March 28-30, 2003. 213p.

Decision Support System. Report of a workshop sponsored by NWRI in cooperation with Tellus Institute. Kellogg West Conference Center/Hotel, California State Polytechnic University, Pomona, CA, February 4-6, 2003. 161 p.

Water Quality and Resource Management Issues. Report of a workshop sponsored by NWRI in cooperation with Lawrence Livermore National Laboratory and University of California. Wente Vineyards, Livermore, California, January 28-30, 2003. 252 p.

Life Cycle Environmental Impacts Associated with Different Fuel Options. Report of a workshop sponsored by NWRI in cooperation with Clarkson University, Lawrence Livermore National Laboratory, and USEPA – Office of Research and Development. Kellogg West Conference Center/Hotel, California State Polytechnic University, Pomona, CA, February 15-17, 2002. 202 p.

Issues in Methanol Research. Report of a workshop sponsored by NWRI in cooperation with the American Methanol Institute. Hilton Hotel, Costa Mesa, CA, October 5-7, 2001. 173 p.

Chino Basin Organics Management. Report of a workshop sponsored by NWRI in cooperation with the Inland Empire Utilities Agency, and the Southern California Alliance of Publicly Owned Treatment Plants. Kellogg West Conference Center/Hotel, California State Polytechnic University, Pomona, CA, April 18-20, 2001.

Desalination Research & Development. Report of a workshop sponsored by NWRI in cooperation with the United States Bureau of Reclamation. Kellogg West Conference Center/Hotel, California State Polytechnic University, Pomona, CA, January 19-21, 2001. 185p.

Knowledge Management. Report of a workshop sponsored by NWRI. Kellogg West Conference Center/Hotel, California State Polytechnic University, Pomona, CA January 5-7, 2001. 169 p.

Oxygenate Contamination. Report of a workshop sponsored by NWRI in cooperation with the United States Bureau of Reclamation. Kellogg West Conference Center/Hotel, California State Polytechnic University, Pomona, CA, September 15-17, 2001: 258p.

Utility Leadership. Report of a workshop sponsored by NWRI in cooperation with Malcolm Pirnie, Inc., the University of Southern California, and the University of South Florida. Kellogg West Conference Center/Hotel, California State Polytechnic University, Pomona, CA, October 24-26, 1999: 154p.

Non-Potable Water Recycling. Report of a workshop sponsored by NWRI in cooperation with Irvine Ranch Water District and the Orange County Water District. Kellogg West Conference Center/Hotel, California State Polytechnic University, Pomona, CA, May 23-25, 1999: 174p.

Conjunctive Use Water Management Program. Report of a workshop jointly sponsored by NWRI, Association of Ground Water Agencies, and the Metropolitan Water District of Southern California. Kellogg West Conference Center/Hotel, California State Polytechnic University, Pomona, CA, May 27-29, 1998: 157p

Barriers to Providing Safe Drinking Water Through Small Systems. Report of a workshop jointly sponsored by NWRI, Pan American Health Organization, and NSF International/WHO Collaborative Center. Pan American Health Organization Headquarters, Washington, D.C., May 13-15, 1998: English report: 175p., Spanish report: 188p. (Bound in a single volume.)

Barriers to Harvesting Stormwater. Report of a workshop jointly sponsored by NWRI, Los Angeles County Department of Public Works, County of Orange Public Facilities & Resources Department, Southern California Coastal Water Project, and the American Oceans Campaign. Kellogg West Conference Center/Hotel, California State Polytechnic University, Pomona, CA, September 22-24, 1997: 159p.

Groundwater Disinfection Regulations Benefits Conference. Report of a conference sponsored by NWRI. Arnold and Mabel Beckman Center, National Academies of Sciences and Engineering, Irvine, CA, March 17, 1997: 75p.

Groundwater Disinfection Regulation. Report of a workshop jointly sponsored by NWRI and the USEPA. Arnold and Mabel Beckman Center, National Academies of Sciences and Engineering, Irvine, CA, January 6-8, 1997: 209p.

Membrane Biofouling. Report of a workshop jointly sponsored by NWRI, UNESCO Centre for Membrane Science and Technology, and CRC for Waste Management and Pollution Control, LTD. UNSW Institute of Administration, Sydney, Australia, November 15-17, 1996: 176p.

The Santa Ana River Watershed. Report of a workshop jointly sponsored NWRI and the Santa Ana Watershed Project Authority. Co-sponsors included: City of San Bernardino Water Department, City of Riverside, Western Municipal Water District, and Orange County Water District. Kellogg West Conference Center/Hotel, California State Polytechnic University, Pomona, CA, August 23-25, 1995: 182p.

The New River. Report of a workshop jointly sponsored by NWRI and the County of Imperial, California. Barbara Worth Country Club, Holtville, CA, May 19-21, 1995: English report: 134p., Spanish report: 134p. (Bound in a single volume)

Establishment of The Middle-East Water and Energy Research and Technology Centre. Report of a workshop jointly sponsored by NWRI and the Sultanate of Oman through the Worldwide Desalination Research and Technology Survey. Muscat, Oman: September 21, 1994: 29p.

Risk Reduction in Drinking Water Distribution Systems. Report of a workshop jointly sponsored by NWRI and the Environmental Criteria and Assessment Office of the USEPA. Arnold and Mabel Beckman Center, National Academies of Sciences and Engineering, Irvine, CA, February 27-28, 1994: 142p.

Fouling and Module Design. Report of a workshop jointly sponsored by NWRI and the National Science Foundation (NSF). Virden Conference Center of the University of Delaware, Lewes, DE, October 30 – November 1, 1993: 115p.

Groundwater Disinfection Rule. Report of a workshop jointly sponsored by NWRI and the USEPA in collaboration with the Weston Institute. Virden Conference Center of the University of Delaware, Lewes, DE. June 7-8, 1992: 103p.

APPENDIX C

PARTICIPANTS' BIOGRAPHICAL SKETCHES

Frank J. Blaha, P.E.

Senior Project Manager

American Water Works Association Research Foundation

Frank Blaha has almost 20 years of environmental engineering and management experience, mostly within the industrial and waste management sectors. Currently, he is a Senior Project Manager for the American Water Works Association Research Foundation, which sponsors research to provide safe and affordable drinking water to consumers. Past projects have focused on the research needed to establish acceptable operations under the requirements of new or upcoming regulations. Since 2001, his research has focused primarily on water security. Blaha received a B.S. in Environmental Health Engineering from Northwestern University and an M.S. in Civil and Environmental Engineering from the University of Wisconsin-Madison. He is a Registered Professional Engineers in the States of Colorado, Kentucky, and South Dakota.

Cheryl K. Davis

Acting Assistant General Manager for Operations

San Francisco Public Utilities Commission

Since 2002, Cheryl Davis has been Acting Assistant General Manager for Operations of the San Francisco Public Utilities Commission, which is a department of the City and County of San Francisco that provides water, wastewater, and municipal power services to San Francisco. As such, she is responsible for directing all operational units, including water and power, water supply and treatment, city distribution, water pollution control, water quality, and environmental regulation and management. She has worked for the San Francisco Public Utilities Commission since 1983. In addition, she served as President and Founding Member of the Northern California Chapter of WaterReuse and was Team Leader for the American Water Works association QualServ Program, among others. Davis received a B.A. in Social Work and an M.A. in Human Relations, with a minor in Regional and City Planning, from the University of Oklahoma.

William B. DeOreo, P.E.

President and Principal Engineer

Aquacraft, Inc.

Bill DeOreo has actively practiced water engineering in Colorado since 1978, working both in the public sector and as a private consultant. His main interests include the development of innovative supplies of water for municipal uses, improving the yield of urban water systems through better water planning and management, integrating urban water uses into watershed analyses, and developing computer-based applications to assist with water planning. DeOreo is a member of the Planning and Evaluation sub-committee of the AWWA Water Conservation national committee, and has served as Principal Investigator on the recent AwwaRF studies on Residential and Commercial End Uses of Water. He has prepared several water conservation plans and has conducted detailed investigations of the impacts of various water conservation programs on urban water demands. DeOreo received a B.A. in Biology from Boston University and both a B.S. and M.S. in Civil and Environmental Engineering from the University of Colorado at Boulder.

David D. Hanson

*Laboratory Manager
Pinellas County Utilities*

David Hanson has 13 years experience in analytical laboratory management, working for both water and electrical utility laboratories, as well as in commercial labs. Currently, he is Laboratory Manager for Pinellas County Utilities, where he is responsible for administrative functions, budget preparation, and staff supervision. The laboratory areas that he has managed include analytical chemistry, staff training, laboratory information management systems, quality assurance, and client services. In addition to working for Pinellas County, Hanson has spent the last 12 years lecturing part-time at Hillsborough Community College in Tampa, Florida. He also spent 7 years as a lecturer at Victoria University in Australia, where he taught subjects such as biology, ecology, and environmental science. Hanson received a B.S. in Physical Education, with a minor in Biology, from Minot State University and an M.S. in Biology from Northern Arizona University.

James L. Henderson

*Senior Associate
Stratus Consulting, Inc.*

Jim Henderson, a Senior Associate at Stratus Consulting, is an economist who specializes in environmental economics, water-resource planning, river basin modeling, and water conservation analysis. He has analyzed many aspects of sustainable water-supply development and management and is experienced in analyzing the cost-effectiveness of water-supply options. He co-authored a study of the sustainability of water resource use in Tucson, Arizona, and has worked on several projects analyzing the water savings, cost-effectiveness, and patterns of participation in water conservation programs. He also managed a planning process for the recharge and recovery of surface water supplies using local aquifers in Tucson. Henderson also developed a computer model of the Colorado River basin for use in a drought-game exercise for the Severe Sustained Drought Project — an interdisciplinary analysis of the functioning of water management institutions under severe drought conditions. He received a B.A. in Economics from Colorado College and an M.S. in Natural Resource Economics from the University of Arizona.

Annette Huber-Lee, Ph.D.

*Senior Scientist
Stockholm Environment Institute*

Annette Huber-Lee is a Senior Scientist in the Water and Development Program at the Stockholm Environment Institute in Boston, Massachusetts. She has more than 15 years of professional experience in international planning and management of water resources, and her areas of specialization include the integration of economic, engineering, and ecological approaches to solve environmental and social problems in a comprehensive and sustainable manner, and the development of innovative approaches to environmental policy and natural resource conflict management. She has developed and applied resource models for projects with issues in allocation, ecosystem preservation, environmental regulations and the economic consequences of environmental laws. Huber-Lee received a B.Sc. in Agricultural Engineering from Cornell University, an M.Sc. in Civil Engineering from the Massachusetts Institute of Technology, and a Ph.D. in Environmental Engineering from Harvard University.

Brian H. Hurd, Ph.D.

*Assistant Professor, Department of Agricultural Economics and Agricultural Business
New Mexico State University*

Brian Hurd has more than 15 years of experience as an environmental and resource economist, and is an expert in agricultural/natural resource economics and the effects/modeling of climatic variability and change on water and agricultural resources. Currently, he is an Assistant Professor in New Mexico State University's (NMSU) Department of Agricultural Economics and Agricultural Business, where he has worked since 2001. His current research focus includes hydro-economic modeling of water resource systems, water resource vulnerability, water system reliability and conservation, the economics of water transfers and water markets, and the impacts of climate change on water resources. He also serves the regional and university communities by participating on both the NMSU College of Agriculture Water Task Force and representing NMSU on the Universities Council on Water Resources. Hurd received a B.A. with honors from the University of Colorado and both an M.S. and Ph.D. in Agricultural Economics from the University of California, Davis.

Cynthia G. Jones

*Corporate Secetary
Berger & Jones Insurance Agency, Inc.*

Cynthia Jones has been an active participant in local politics, as well as being Corporate Secretary and Bookkeeper at the family-owned business, Berger & Jones (est. 1924). She served 6 years on the San Ramon Valley Regional Planning Commission from 1989-1995, twice acting Chair. In 1994 and again in 1998, she was elected to the Board of Directors of the Dublin San Ramon Services District. The special district is a sewer and water agency serving here cities, covering parts of Alameda and Contra Costa Counties in Northern California. She served as President of the board in 1997 & 2002. During her tenure on the board, she became an avid proponent of Water Recycling. She has been a presenter to the WaterReuse Association in California; sat on the board of DERWA (DSRSD EBMUD Recycled Water Authority); and given talks and lectures on the "Clean Water Revival" project, an MF, RO, UV project in her area. Jones holds a degree in Government from California State University in Sacramento, and is an alumni of the University of the Pacific. She is also a fifth generation Californian.

Kris P. Lindstrom, MPH, REHS

*President
K.P. Lindstrom, Inc.*

Kris Lindstrom has 32 years of experience in the fields of water quality and environmental health planning as well as environmental impact assessment. He is a Registered Environmental Health Specialist in California, and he has prepared numerous environmental studies, facilities plans, and technical reports with public agencies and regulatory agencies. Since 1978, he has been president of his own firm, K.P. Lindstrom, Inc., which provides consulting services to agencies responsible for managing water and wastewater. Clients include many water and wastewater districts in California. In addition, he serves as an elected Director of the Monterey Peninsula Water Management District, which serves the greater Monterey area on the central coast of California. Lindstrom received a B.S. in Biological Sciences from the University of California, Irvine, an M.P.H. in Environmental Health Sciences from the University of California, Berkeley, and an M.S. in Ecology from the University of California, Davis.

Bruce A. Macler, Ph.D.

*National Microbial Risk Assessment Expert
United States Environmental Protection Agency*

Bruce Macler has provided toxicology and risk assessment expertise on environmental water issues for the U.S. Environmental Protection Agency (USEPA) since 1989. He manages regulatory workgroups and an extensive research program on drinking-water treatment and is involved in public outreach and communication. Prior to joining the USEPA, he held academic and research positions at NASA, the University of California, Berkeley, and State University of New York at Stonybrook. Macler has authored more than 90 articles and research publications on biotechnology, microbial risk assessment, and drinking-water regulations, and teaches and lectures widely. His recent honors include the USEPA's Regional Administrator's Award (2000) and Bronze Medal (2000) as well as the George A. Elliott Award from the American Water Works Association (2000). Macler received both a B.A. and Ph.D. in Biochemistry from the University of California, Berkeley.

Maria G. Mariscal

*Senior Water Resources Specialist
San Diego County Water Authority*

Since 1990, Maria Mariscal has been a Senior Water Resources Specialist with the San Diego County Water Authority, a regional water agency that provides about 90 percent of the water used in San Diego County. Among her responsibilities, she is involved in developing and funding water-recycling projects implemented by the Authority's member agencies. She also developed the Authority's first regional water conservation program and had developed and implemented conservation projects, such as toilet rebate and plumbing retrofit programs. In addition to her duties with the Authority, she is currently a member of the Public Relations Committee of the WaterReuse Association, San Diego Chapter. She was also a member of the Commercial, Industrial, and Institutional Subcommittee and the Implementation and Reporting Subcommittee of the California Urban Water Conservation Council. Mariscal received a B.A. and M.A. in Public Administration from San Diego State University.

Edward G. Means III

*Senior Vice President
McGuire Environmental Consultants, Inc.*

Ed Means is Sr. Vice President of McGuire Environmental Consultants. His areas of expertise include performing water-quality management assessments, developing and implementing long-range utility water resource and quality and management strategies/plans, and conducting laboratory management evaluations. He provides services to water utilities in the areas of regulatory compliance, including the Microbial/Disinfection By-Products rule cluster, Arsenic rule, Radon rule, and Groundwater rule. Recently, Means was Project Manager for the AwwaRF project, "Strategic Future of Water Utilities," and was a Project Team member on AwwaRF's *Characterizing Salinity Contributions in Sewer Collection and Reclaimed Water Distribution Systems to Develop Salinity Management Strategies*. Means received a B.A. and M.A. in the School of Social Ecology, emphasis on Environmental Analysis, at the University of California, Irvine, and graduated from the Professional Management Program of the Graduate School of Business Administration at the University of Southern California.

James E.T. Moncur, Ph.D.

*Director, Water Resources Research Center
Professor, Department of Economics
University of Hawaii at Mañoa*

James Moncur is Professor of Economics and Director of the Water Resources Research Center at the University of Hawaii at Mañoa. After joining the Hawaii faculty in 1969, he has served as visiting faculty at Thammasat University (Bangkok) and Brigham Young University, teaching environmental economics and econometrics. His research has concentrated on estimating water demand; estimating scarcity value of water in situ; the design of institutions for water allocation; and modeling of hydro-economic systems. Moncur's current research includes a pollution assessment and remediation plan for Nawiliwili Bay in Kauai, as well as a desalination economics study for Honolulu, among others. In addition to his duties at the University, he was former President of the Universities Council on Water Resources and is incoming President of the National Institutes for Water Resources. Moncur received a B.A. and M.A. in Economics from the University of Wyoming and a Ph.D. in Economics from Washington State University.

Robert Raucher, Ph.D.

*Executive Vice President
Stratus Consulting*

Bob Raucher, Executive Vice President at Stratus Consulting, specializes in environmental economics and natural resource valuation methods, and has extensive experience applying economic and management tools to public water supply and wastewater utility issues and water resources management. He has considerable experience in regulatory and legislative issues affecting water utilities and water use, and has recently led efforts by three national water supply associations to assess water system security and anti-terrorism needs and solutions. Currently, he is Principal Investigator on an AwwaRF project investigating various decentralized and other "unconventional" approaches to water supply provision as a blueprint for understanding how water delivery and use may change through the twenty-first century. Raucher received a B.A. in Economics and Anthropology from the State University of New York, Albany, and both an M.S. in Econometrics and a Ph.D. in Natural Resource Economics and Public Finance from the University of Wisconsin-Madison.

Eric G. Reichard, Ph.D.

*Research Hydrologist/Coastal Programs Chief
U.S. Geological Survey, California District*

Since 1980, Eric Reichard has worked for the U.S. Geological Survey, which serves as an independent fact-finding agency that collects, monitors, analyzes, and provides scientific understanding about natural resource conditions, issues, and problems in the United States. Currently, Reichard serves as Program Chief of Coastal Projects, California District. He is the author of numerous publications, his most recent entitled, "Economics of Conjunctive Use of Ground Water and Surface Water," which will be published in November 2003 in *Water Resource Issues, Challenges, and Opportunities*, published by the American Geophysical Union. In addition to his work with the U.S. Geological survey, he was also a Research Fellow in the Environmental Health and Public Policy Program at the Harvard School of Public Health. Reichard received a B.A. in Economics from the University of Rochester and both an M.S. and Ph.D. in Applied Earth Science-Hydrogeology from Stanford University.

Mary E. Renwick, Ph.D.

Senior Fellow

University of Minnesota Water Resources Center

Mary Renwick is Senior Fellow at the University of Minnesota Water Resources Center. Currently, she holds four other appointments at the university: Adjunct Professor of the Department of Applied Economics; Graduate Faculty Member of the Water Resources Graduate Program; Graduate Faculty Member of the Interdisciplinary Center for the Study of Global Change; and Graduate Faculty Member of the Conservation Biology Program. In addition to her work at the University, Renwick is a consultant for numerous groups in the West Coast and in Sri Lanka, and was involved in many committees, such as the Planning Committee of Minnesota Water and Co-coordinator of the Lower Minnesota River Watershed Strategic Action Plan. Renwick received a B.S. in Economics, Agricultural Economics, and Mathematics from the University of Minnesota, and both an M.S. and Ph.D. in Applied Economics from the Food Research Institute at Stanford University.

Steve Rossi

Principal Water Resources Planner

City of Phoenix Water Services Department

Since 2001, Steve Rossi has been the City of Phoenix's Principal Water Resources Planner, where he is responsible for ensuring that sufficient high-quality water supplies are available to meet the needs of current and future customers of the Phoenix water system. He is also responsible for overseeing a diverse range of projects involving water rights and water policy, research, salinity management, and infrastructure planning. Rossi previously directed the State of Arizona's Assured Water Supply Program with the Arizona Department of Water Resources. There, his responsibilities included policy and regulatory development, program implementation, management of groundwater recharge and water rights programs, conservation planning, and technical assistance. Rossi received a B.A. in Geography and Regional Planning from California State University, Chico, and completed graduate studies in Water Resources Administration at the University of Arizona.

Susan M. Trager

Attorney

Law Offices of Susan M. Trager

Susan Trager is Founder and Attorney for the Law Offices of Susan M. Trager, a law firm established in 1980 that specializes in issues involving water rights, water quality, water resources management, water rights valuation, groundwater management, municipal law, eminent domain, land use, and wetlands and endangered species. She has tried eminent domain cases involving the valuation of water resources, including one which resulted in a jury verdict of \$43,200,000, including \$13,000,000 for the taking and impacts to water rights. In addition to her work as an attorney, she serves on the editorial board of California Water Law and Policy Reporter and served as a faculty member of the summer program of the Natural Resources Law Center at the School of Law of the University of Colorado. She was appointed to serve as Director of the Laguna Beach County Water District in 2000. Trager received a B.S. in Journalism from the University of Colorado and a J.D. from Golden Gate University School of Law in San Francisco.

Jason Weeks, P.E.*Engineer**Water Replenishment District*

Since 2001, Jason Weeks has been an Engineer for the Water Replenishment District, which manages groundwater for 3.5 million residents in 43 cities of southern Los Angeles County, California. Among his responsibilities, he worked on the development of the District's Strategic Plan, as well as the Capital Improvement Program. He also conceptualized and developed various groundwater banking and storage agreements in the Central and West Coast Groundwater Basins. Prior to joining the District, Weeks was a Water Resources Engineer for the engineering consulting firms CH2M Hill and Psomas, and worked as a Geographic Information System Coordinator for the Town of Farragut in Tennessee. Weeks received both a B.S and M.S. in Civil Engineering from Tennessee Technological University, and is a Professional Engineer in the State of California.

Bret Weingart*Assistant Director, Water & Wastewater Utilities Department**The City of Oklahoma City*

Bret Weingart has 20 years of progressive leadership experience in large municipal utilities. He is currently employed by the City of Oklahoma City, where he has worked since 1993. At present, he is as Assistant Director of the Water & Wastewater Utilities Department – which treats approximately 80 million gallons per day, with a peak consumption day of 185.62 million gallons – and is responsible for utility finances, procurement, personnel management, customer education, and contract administration. Prior to this, he served as acting Director and Business Manager of the Department. Weingart received a B.S. in Public Affairs, Minor in Accounting and Economics, from Emporia State University, and a Masters of Public Administration, emphasis on local government management and finance, from Wichita State University.

APPENDIX D

PARTICIPANTS' ADDRESS LIST

Frank Blaha, P.E.
Senior Project Manager
AwwaRF
6666 W. Quincy Avenue
Denver, CO 80235
Phone: 303-347-6244
Fax: 303-730-0851
Fblaha@awwarf.org

Cheryl Davis
Acting Assistant General Manager of
Operations
San Francisco Public Utilities Commission
1155 Market Street, 4th Floor
San Francisco, CA 94103
Phone: 415-554-2465
Fax: 415-554-3424
ckd@sfwater.org

William DeOreo, P.E.
President and Principal Engineer
Aquacraft, Inc.
2709 Pine Street
Boulder, CO 80302
Phone: 505-564-2674
Fax: 505-786-8337
bill@aquacraft.com

David D. Hanson
Laboratory Manager
Pinellas County Utilities
1620 Ridge Road, Bldg. B
Largo, FL 33778
Phone: 727-582-2310
Fax: 727-588-4834
dhanson@co.pinellas.fl.us

Jim Henderson
Senior Associate
Stratus Consulting, Inc.
1881 9th Street, Suite 201
Boulder, CO 80302
Phone: 303-381-8000
Fax: 303-381-8200
jhenderson@stratusconsulting.com

Annette Huber-Lee, Ph.D.
Senior Scientist
Stockholm Environment Institute
Tellus Institute
11 Arlington Street
Boston, MA 02116+
Phone: 617-266-5400
Fax: 617-266-8303
ahuberlee@tellus.org

Brian Hurd, Ph.D.
Assistant Professor
Ag. Econ. MSC 3169 Box 30003
New Mexico State University
Las Cruces, NM 88003
Phone: 505-646-2674
Fax: 505-646-3522
Bhhurd@nmsu.edu

Cynthia Jones
Berger and Jones Insurance Agency, Inc.
2694 Bishop Drive, Ste. 104
San Ramon, CA 94583
Phone: 925-277-9090
Fax: 925-277-9095
cynthiajones@lycos.com

Kris P. Lindstrom, MPH, REHS
President
K.P. Lindstrom, Inc.
729 Bay View Avenues
Pacific Grove, CA 93950
Phone: 831-372-5989
Fax: 831-372-6168
kplinc@redshift.com

Bruce A. Macler, Ph.D.
National Microbial Risk Assessment Expert
United States Environmental Protection
Agency
75 Hawthorne Street, WTR-6
San Francisco, CA 94105
Phone: 415-972-3569
Fax: 415-947-3549
Macler.bruce@epa.gov

Maria Mariscal
Senior Water Resources Specialist
San Diego County Water Authority
4677 Overland Avenue
San Diego, CA 92123
Phone: 858-522-6740
Fax: 858-268-7881
mmariscal@sdcwa.org

Ed Means III
Senior Vice President and Principal
McGuire Environmental Consultants
3471 Via Lido #207
Newport Beach, CA 92663
Phone: 949-723-8835
Fax: 949-723-8831
emeans@mcquireinc.com

James Moncur, Ph.D.
Director
Water Resources Research Center
University of Hawaii
2540 Dole Street, Room 283
Honolulu, HI 96822
Phone: 808-956-7847
Fax: 808-956-5044
jmoncur@hawaii.edu

Robert Raucher, Ph.D.
Executive Vice President
Stratus Consulting, Inc.
1881 9th Street, Suite 201
Boulder, CO 80302
Phone: 303-381-8000
Fax: 303-381-8200
braucher@stratusconsulting.com

Eric Reichard, Ph.D.
Research Hydrologist/Coastal Programs
Chief
United States Geological Survey
5735 Kearny Villa Road, Ste. O
San Diego, CA 92123
Phone: 858-637-6834
Fax: 858-637-9201
egreich@usgs.gov

Mary Renwick, Ph.D.
Senior Fellow
Water Resources Center
University of Minnesota
173 McNeal Hall
1985 Buford Avenue
St. Paul, MN 55108
Phone 612-625-9798
Fax: 612-625-1263
Renwi001@umn.edu

Steve Rossi
Principal Water Resources Planner
City of Phoenix Water Services Department
200 W. Washington Street, 8th Floor
Phoenix, AZ 85003
Phone: 602-495-3669
Fax: 602-495-5843
Steve.Rossi@phoenix.gov

Susan M. Trager
Attorney
Law Offices of Susan Trager
19712 MacArthur Blvd., Ste. 120
Irvine, CA 92612
Phone: 949-752-8971
Fax: 949-863-9804
smt@tragerlaw.com

Jason Weeks, P.E.
Engineer
Water Replenishment District
12621 E. 166th Street
Cerritos, CA 90703
Phone: 562-407-1906
Fax: 562-407-1906
jweeks@ wrd.org

Bret Weingart
Assistant Director
Water & Wastewater Utilities Department
The City of Oklahoma City
420 W. Main Street, Ste. 500
Oklahoma, OK 73102
Phone: 405-297-2828
Fax: 405-297-3610
Bret.weingart@okc.gov

WORKSHOP STAFF

Linda Harp
Moya Lyttle
Helen Fickensher
Word Processors
Appleone Employment Services
16371 Beach Blvd.
Huntington Beach, CA 92647

Barbara Close
Graphics
16148 Orsa Drive
La Mirada, CA 90638
714-522-3084
714-523-4201 Fax
BarbiCL@aol.com

Tim Hogan
Graphics Assistant
6412 Navajo Road
Westminster, CA 92683
(714) 903-3991 Phone & Fax

Patricia Linsky
Editor
476 Esther Street
Costa Mesa, CA 92627
949-650-3431
949-650-3681 Fax
rblinsky@earthlink.net

Ronald B. Linsky
Executive Director
National Water Research Institute
10500 Ellis Avenue
Fountain Valley, CA 92708
(714) 378-3278
(714) 378-3375 Fax
Rlinsky@nwri-usa.org

Gina Melin
Editor
National Water Research Institute
10500 Ellis Avenue
Fountain Valley, CA 92708
(714) 378-3278
(714) 378-3375 Fax
Gmelin@nwri-usa.org

Tammy Russo
Administrative Assistant/
Workshop Coordinator
National Water Research Institute
10500 Ellis Avenue
Fountain Valley, CA 92708
(714) 378-3278
(714) 378-3375 Fax
Trusso@nwri-usa.org

Teresa Taylor
Photographer
T. Taylor Photography
23010 Lake Forest Dr., Ste. D-401
Laguna Hills, CA 92653
949-461-0606
949-461-0688 Fax
www.ttaylorphoto.com

APPENDIX E

WORKING GROUPS' VISUAL PRESENTATIONS

Copyright 2003 by National Water Research Institute

Published September 29, 2003

By

NATIONAL WATER RESEARCH INSTITUTE

10500 Ellis Avenue

Fountain Valley, CA 92708

P.O. Box 20865

Fountain Valley, CA 92728-0865

National Water Research Institute Report Number NWRI-2003-11